Colorado Transportation Commission
Schedule & Agenda

January 15-16, 2025
12:00 p.m.

Transportation Commission Workshops

Wednesday, January 15, 2025

Time	Topic	Speaker
12:00 p.m.	Lunch for Commissioners (optional)	None
1:00 p.m.	Budget Workshop • FY '26 Budget Update • Revenue Forecast Update • State match for federal PROTECT grant application for avalanche mitigation	Jeff Sudmeier and Bethany Nicholas
1:45 p.m.	Fuel Impact Enterprise (FIE) Workshop on Budget, Funding Distribution and Potential Projects	Darius Pakbaz and Craig Hurst
2:15 p.m.	CDOT Speed Safety Camera Program	San Lee and Ben Acimovic
2:45 p.m.	Bridge and Tunnel Enterprise (BTE) Workshop on BTE 10-Year Plan Financing	Patrick Holinda and Katie Carlson
3:15 p.m.	Request for Approval- Public Private Initiative Agreement	Bob Fifer and Heather Paddock
4:00 p.m.	Adjourn	

Transportation Commission Meeting

Thursday, January 16, 2025

Time	Topic	Speaker
8:00 a.m.	Commission Breakfast	None
9:00 a.m.	Call to Order, Roll Call, Swearing in of New Commissioner	Herman Stockinger
9:05 a.m.	Public Comments	Various
9:15 a.m.	Comments of the Chair and Commissioners	Commissioners
9:25 a.m.	Executive Director's Management Report	Shoshana Lew
9:30 a.m.	Chief Engineer's Report	Keith Stefanik
9:35 a.m.	CTIO Director's Report	Piper Darlington
9:40 a.m.	Legislative Report	Emily Haddaway
9:45 a.m.	FHWA Division Administrator Report	John Cater
9:50 a.m.	STAC Report	Gary Beedy
9:55 a.m.	Act on Consent Agenda: Proposed Resolution #1: Approve the Regular Meeting Minutes of December 18, 2024 Proposed Resolution #2: IGA Approval >$750,000	Herman Stockinger Lauren Cabot

10:00 a.m.	Proposed Resolution #3: Disposal Parcel 47REV-EX located at Marshall St. and W 49th Drive in Wheat Ridge Proposed Resolution #4: Disposal Parcel 350-EX located at US Highway 50 and Morris Ave in Pueblo Proposed Resolution #5: FY ’25 Maintenance Projects - $150k-$300k Proposed Resolution #6: STIP Amendment #3, Additional Funding for US 287 Safety Improvements	Jessica Myklebust Shane Ferguson John Lorme and Jim Fox Jamie Collins
10:05 a.m.	Discuss and Act on Proposed Resolution #7: 5th Budget Amendment of FY ’24-’25.	Jeff Sudmeier
10:10 a.m.	Discuss and Act on Proposed Resolution #8: PPACG GHG Transportation Report for the 2050 RTP	Darius Pakbaz
10:15 a.m.	Recognitions: US 50 Blue Mesa Bridges Project Recognition of CDOT Awards - Women’s Transportation Seminar (WTS)	Jason Smith, Keith Stefanik Jessica Myklebust
10:35 a.m.	Other Matters	None
10:40 a.m.	Adjournment	None

The Bridge and Tunnel Enterprise Board of Directors will not be meeting in January.

The Fuels Impact Enterprise Board of Directors will not be meeting in January.

Information Only

- Project Budget/Expenditure Memo (Jeff Sudmeier)
- Revenue Forecast Update (Jeff Sudmeier)
- November 2024 TC Grants Memo (Anna Dunn)
- Globeville and Elyria Swansea (GES) Tolling Equity Program Progress Report (Piper Darlington and Simon Logan)
- 2024 RTA Annual Report (Bruce Eisenhauer, DOLA)
- WTS Award Information

Transportation Commission Memorandum

To: The Transportation Commission
From: Jeff Sudmeier, Chief Financial Officer
Bethany Nicholas, CDOT Budget Director
Date: January 15, 2025

Subject: Update on FY 2025-26 Annual Budget

Purpose

To provide an update on items related to the FY 2025-26 Annual Budget.

Action

No action is required at this time.

Revenue Forecast Update

CDOT HUTF Revenue

The Office of Financial Management and Budget (OFMB) released its second FY 2024-25 quarterly revenue forecast, which is summarized in an informational memo in this month's packet. OFMB reduced its forecast for fuel tax and fee revenue compared to the previous quarter. Based on data through November, the revenue from actual fuel taxes and fees has been underperforming compared to recent fiscal years. These changes result in a reduction of $12.8 million in CDOT's HUTF that is available for the FY 2025-26 Annual Budget.

Fee	FY26 Q1 Forecast	FY26 Q2 Forecast	Variance
CDOT First Stream Revenue	$115.9	$112.4	-$3.6
CDOT Second Stream Revenue	$425.1	$415.8	-$9.3
CDOT FASTER	$79.1	$79.1	$0.0
Statewide HUTF Revenue	**$620.2**	**$607.3**	**-$12.8**

The FY 2025-26 Proposed Annual Budget Allocation Plan included $18.4 million in surplus flexible state funds that was temporarily allocated to the Commission Reserve Funds line. Based on the revised revenue forecast, that amount is reduced by $12.8 million to $5.6 million. Updated allocations will be presented in February 2025.

FHWA Revenue

As discussed with the Commission in the fall, staff reduced the assumption for the

FHWA obligation limitation percentage for the FY 2025-26 Annual Budget to more accurately reflect the actual obligation limitation received over the last few years. The obligation limitation percentage is forecasted by staff to develop the Department's annual budget. It restricts the federal revenues that will be available to the Department through the annual Transportation Appropriations Acts. The limitation is placed on the amount of base federal formula funding a state may obligate during a fiscal year, which impacts the amount of reimbursements the federal government may make to the state or its subrecipients. The FY 2025-26 Proposed Annual Budget Allocation Plan used an assumption of 87% for obligation limitation to mitigate against large reductions when the FHWA allocations are trued-up during revenue reconciliation.

Congress recently passed the Water Resources Development Act (WRDA) of 2024, which includes a change to provide state DOTs with four years of obligation limitation for base formula programs. If enacted, this change could reduce total obligation limitation that is available for the August redistribution process, but would also increase overall obligation limitation for base formula programs within the annual appropriations acts. Staff is monitoring the legislation and will analyze potential impacts to the CDOT budget to determine whether or not an upward adjustment to the obligation limitation percentage is needed before the budget is finalized.

Update on the FY 2025-26 Annual Budget

The Proposed FY 2025-26 Annual Budget Allocation Plan, which includes the narrative and all budget appendices, is available on the Department's website. The Proposed FY 2025-26 Revenue Allocation Plan totals $2,162.1 million for CDOT and the transportation enterprises. Staff is working to develop the Final FY 2025-26 Annual Budget Allocation Plan which will be available for the Commission to review during the February Budget Workshop.

Decision Items

During the FY 2025-26 budget-building process, CDOT divisions and regions can request decision items, which are requests for funding that represent a significant change to a division's current program (e.g., new or expanded programs or investments). In accordance with Policy Directive (PD) 703.0, decision item requests of less than $1 million are reviewed and subject to approval by the EMT, while decision items of $1 million or greater are reviewed by the EMT and then forwarded to the TC for consideration, with final approval with the Final Annual Budget Allocation Plan in March 2025. The TC will have an opportunity to review any potential decision item requests during the February 2025 Budget Workshop, prior to the March adoption of the Final FY 2025-26 Annual Budget Allocation Plan.

Currently, the EMT is reviewing decision items that total approximately $2.5 to $3.0 million. If all of these requests are approved by the EMT for inclusion in the Final

Budget, staff will need to reallocate that amount from the balance in the Commission Reserve Funds line to the impacted budget lines, in particular the Agency Operations line. This would leave a balance of approximately $2.6 million in the Commission Reserve Funds line for allocation to other programs, or to allocate for state match to federal programs if the obligation limitation percentage is increased.

Update on CDOT's Legislative Budget

The Governor's Budget Request includes four decision items that were submitted by CDOT, which are briefly summarized below. It is important to note that each of the items below are *proposed* changes, and must still work their way through the legislative process in 2025 before becoming law. More detail on the Governor's Budget Request including proposals relevant to CDOT can be found on the Office of State Planning and Budgeting website.

R-01 Multimodal Options Fund Spending Authority

The request includes three components: 1) increase spending authority by $50.4 M in FY26 to align with the forecasted fund balance in the MMOF, 2) one additional year of roll forward authority for the SB 21-260 American Rescue Plan Act (ARPA) appropriation that lapses in FY 2024-25, and 3) legislation to continuously appropriate the MMOF.

R-02 Continuous Spending Authority for Clean Transit Enterprise Cash Fund

This request is being submitted by CDOT on behalf of the Clean Transit Enterprise (CTE) Board. Similar to the MMOF request above, the CTE is requesting that the JBC sponsor legislation to continuously appropriate the Clean Transit Enterprise Cash Fund.

R-03 Reduce SB 21-260 Transfers and Extend the Funding

As part of statewide efforts across agencies to balance the State's budget, the Department requests to reduce the transfer to the State Highway Fund by $39.0 million in FY 2025-26 and by $24.5 million in FY 2026-27. Then the Department requests to shift out the funding to later dates to ensure CDOT stays whole as intended in SB 21-260.

R-04 Reduce Road Safety Surcharge and Distribution Update

As part of statewide efforts across agencies to help balance the State's budget, the Department proposes a reduction to the Road Safety Surcharge, resulting in a $65.1M decrease in state FASTER revenue subject to TABOR.

Status on Decision Items and Legislative Proposals

CDOT's hearing with the Joint Budget Committee was held on December 10, 2024. This was an opportunity for the EMT to discuss CDOT's budget priorities and respond to questions the JBC members asked about CDOT's budget and decision items. The presentation materials can be found on the Joint Budget Committee's website. Staff expects the JBC to vote on appropriated lines in the CDOT budget during their annual figure setting process, typically held in February or March, and then the Long Bill will be introduced by early April.

As we move forward with the budget development cycle, staff will monitor legislative proposals related to the Governor's Budget Request, as well as other potential funding proposals, and provide updates to the TC as information becomes available.

Impacts of Proposed Legislation on the CDOT Budget

After session concludes, staff anticipates amending the FY 2025-26 Annual Budget to:

1. Make adjustments based on outcomes of CDOT Decision Items including budget reduction Decision Items; and
2. Incorporate additional funding if any legislative funding measures pass.

Potential Additional Changes to the FY 2025-26 Budget

The following outstanding items could result in further changes to the FY 2025-26 Annual Budget Allocation Plan:

- **Legislative Changes:** Staff will closely monitor proposed legislation that is introduced during the 2025 legislative session and assess whether any proposals under consideration will have an impact on the FY 2025-26 CDOT budget.

- **Updates to Capital Construction Allocations:** The TC will have an opportunity to consider changes to capital construction program allocations, as discussed above, ***including offsetting impacts to the FASTER Safety program***.

- **Decision Items:** The TC will have an opportunity to review any potential Decision Item requests during the February 2025 Budget Workshop, prior to the March adoption of the Final FY 2025-26 Annual Budget Allocation Plan.

- **Administration (Line 67):** Legislative and OSPB actions during the budget development cycle may require further changes in Administration spending for CDOT. The Administration number will be updated throughout the fall and winter.

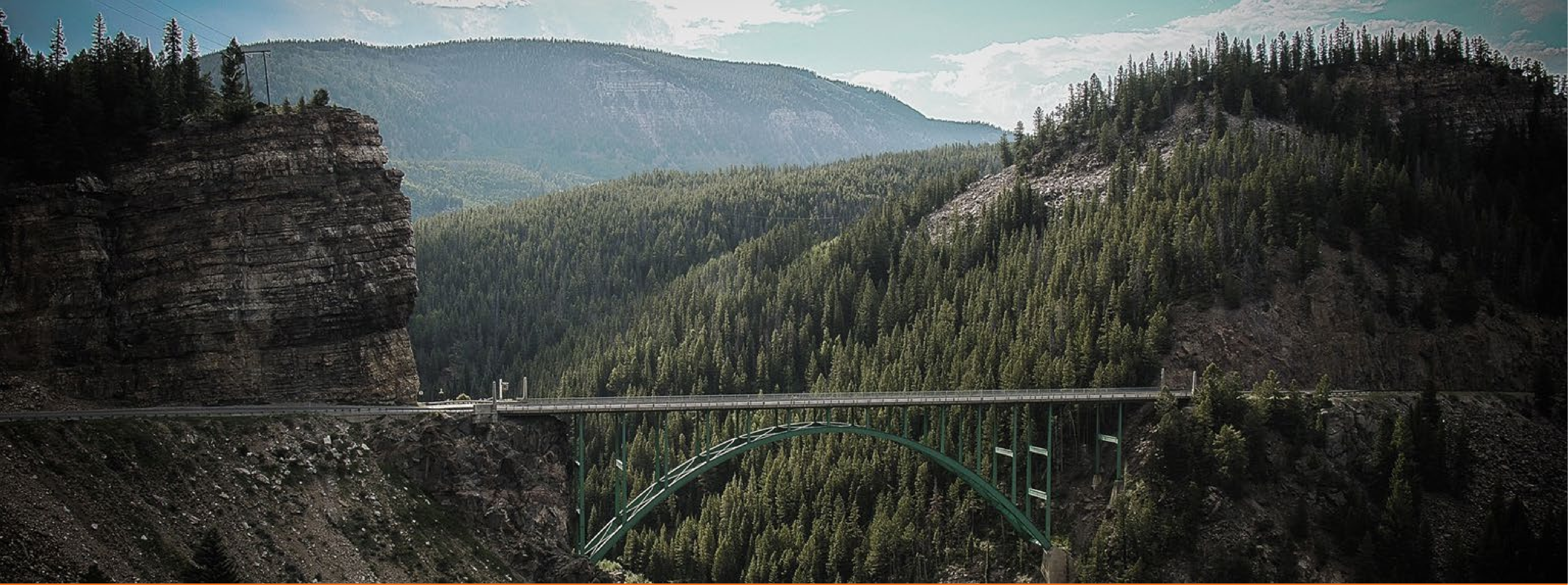
- **Maintenance Reserve (Line 36) and Contingency Reserve (Lines 72 and 73):** After final adjustments for common policy, etc., and consideration of current balances in Maintenance and Contingency Reserve Funds, the Commission may also be asked to consider options for the allocation of any residual flexible HUTF funding or flexible federal funding, including amounts currently allocated to the Maintenance and Contingency Reserve lines, to other programs.

Next Steps

- In February 2025, the TC will be asked to review any Decision Items that are $1 million or more, additional changes related to common policy updates, legislative changes, changes resulting from updated revenue forecasts, or any other changes.
- In March 2025, the TC will be asked to review and adopt the Final FY 2025-26 Annual Budget Allocation Plan.

Attachments

Attachment A – Presentation



COLORADO
Department of Transportation

January 2025 Budget Workshop
Update on FY26 Annual Budget

Agenda

- Updated FY26 Revenue Forecast
  - HUTF Forecast
  - Federal Obligation Limitation Update
- FY26 CDOT Decision Items
- Update on Legislative Budget Process
  - R-01 Multimodal Options Spending Authority
  - R-02 Clean Transit Enterprise Cash Fund
  - R-03 SB 21-260 General Fund Transfers
  - R-04 Reduce Road Safety Surcharge
  - Legislative Budget Status
- Timeline and Next Steps

Fire engine at Eisenhower-Johnson memorial tunnel

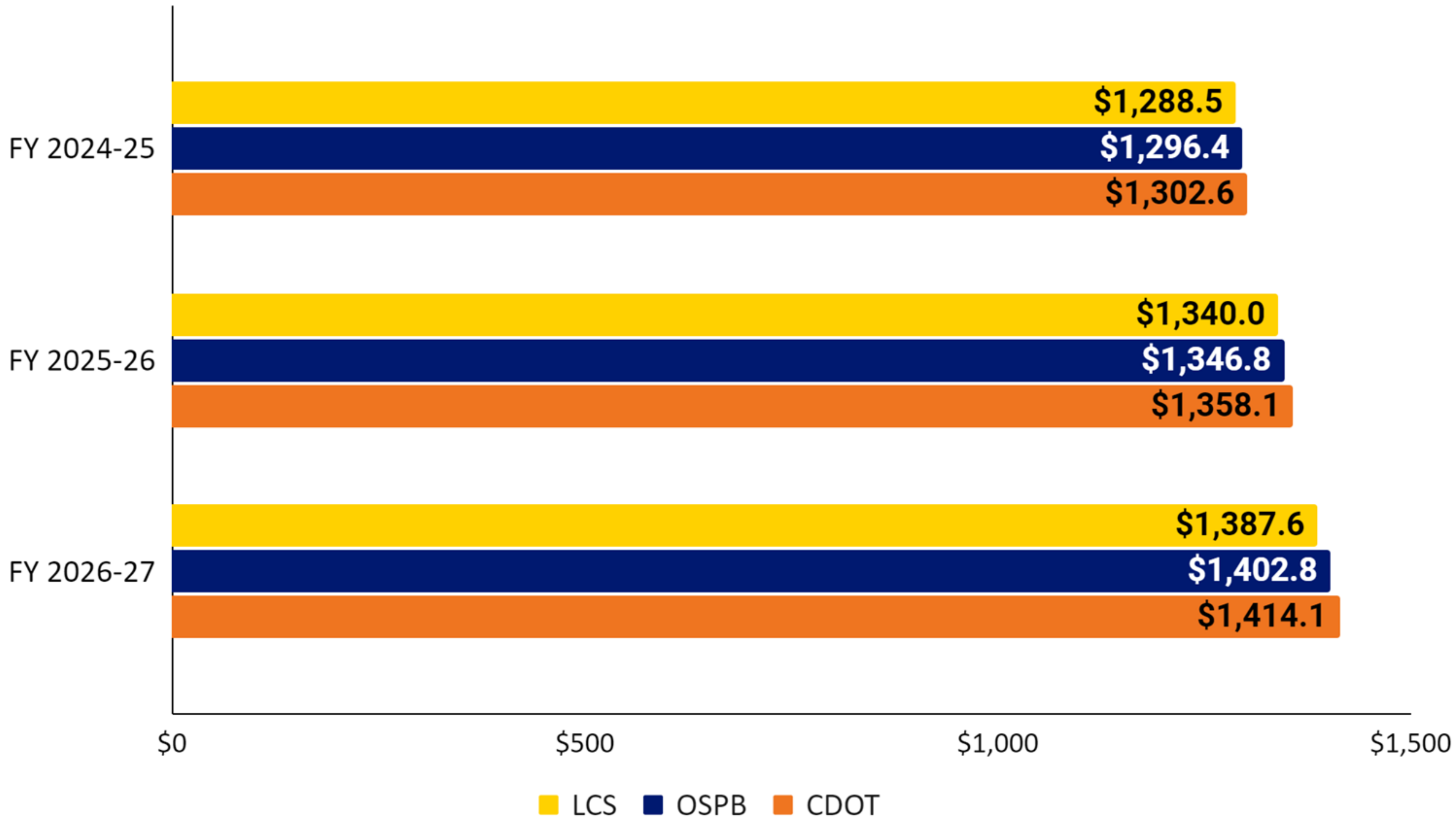
Updated HUTF Revenue Forecast

Legislative Council Staff (LCS), the Governor's Office of State Planning and Budgeting (OSPB), and CDOT's OFMB all reduced the forecast for fuel tax and fee revenue compared to the previous quarter.

Based on data through November, the revenue from actual fuel taxes and fees has been underperforming compared to recent fiscal years.

OFMB will continue to monitor this revenue and make adjustments as needed in future quarters.

Please see the info only Revenue Forecast Update memo in this month's packet for more details!



Updated CDOT HUTF Revenue Forecast

Fee	FY26 Q1 Forecast	FY26 Q2 Forecast	Variance
CDOT First Stream Revenue	$115.9	$112.4	-$3.6
CDOT Second Stream Revenue	$425.1	$415.8	-$9.3
CDOT FASTER	$79.1	$79.1	$0.0
Statewide HUTF Revenue	**$620.2**	**$607.3**	**-$12.8**

This table outlines the forecasted changes to CDOT's HUTF revenue resulting from the reduced forecast for fuel tax and fee revenue.

For the FY26 Annual Budget, the balance of flexible state funds that was temporarily allocated to the Commission Reserve Funds Line will be reduced by $12.8 million (from $18.4M to $5.6M). Updated allocations will be presented in February 2025.

Assumption for Federal Obligation Limitation

- In prior years, the Department assumed it could obligate 93% of apportionments during the budget development process, and then performed a true-up to the actual obligation limitation percentage during revenue reconciliation.
- Flexible federal funds are reconciled within the TC Program Reserve so a high assumption results in a negative adjustment. This has historically been offset by a higher FHWA redistribution.
- For FY26, staff will reduce the obligation limitation assumption to 87% to mitigate against large reductions to the TC Program Reserve during revenue reconciliation.
- Residual flexible FHWA revenues are typically allocated to the 10 Year Plan, so this change will reduce available funds to the 10 Year Plan in FY26. This could be addressed by allocating a portion of future redistribution funds.

Type	93% Ob Limit	87% Ob Limit	Difference
FHWA Flexible	$460.4 M	$430.4 M	($30.0 M)
FHWA Inflexible	$317.9 M	$301.4 M	($16.5 M)
Total FHWA	$778.3 M	$731.8 M	($47.6 M)

Update: Congress is considering legislation that might impact future obligation limitation for state DOTs. OFMB is monitoring this legislation and will determine if there is a need (or not) for an upward modification to the federal forecast.

FY26 CDOT Decision Items

- During the FY 2025-26 budget-building process, CDOT divisions and regions can request decision items, which are requests for funding that represent a significant change to a division's current program (e.g., new or expanded programs or investments).
- Per Policy Directive (PD) 703.0, decision item requests of less than $1 million are reviewed and subject to approval by the EMT, while decision items of $1 million or greater are reviewed by the EMT and then forwarded to the TC for consideration, with final approval with the Final Annual Budget Allocation Plan in March 2025.
- The TC will have an opportunity to review any potential Decision Item requests during the February 2025 Budget Workshop, prior to the March adoption of the Final FY 2025-26 Annual Budget Allocation Plan.

Decision Items that are currently under review by the EMT total approximately $2.5M to $3.0M. Approving all of these requests would require a reallocation of approximately $2.5M to $3.0M from the Commission Reserve Funds line to the Agency Operations line, leaving a balance of approximately $2.6M in the Commission Reserve Funds line after accounting for changes to the CDOT HUTF revenue forecast.

FY26 Legislative Budget - Decision Items

The Governor's FY26 Budget Request includes four decision items submitted by CDOT

- **R-01 Multimodal Options (MMOF) Spending Authority -** 1) increase spending authority by $50.4 M in FY26 to align with the forecasted fund balance in the MMOF, 2) one additional year of roll forward authority for the SB 21-260 American Rescue Plan Act (ARPA) appropriation that lapses in FY 2024-25, and 3) legislation to continuously appropriate the MMOF.

Line Number	One Sheet Budget Line	Initial Allocation	Updated Allocation	Change
62	Multimodal Options Program - Local	$17.8 M	$68.2 M	$50.4 M

- **R-02 Clean Transit Enterprise (CTE) Cash Fund -** submitted by CDOT on behalf of the CTE Board. Similar to the MMOF request above, the CTE is requesting that the JBC sponsor legislation to continuously appropriate the CTE Cash Fund.

(R-02 does not impact the Revenue Allocation Plan)

FY26 Legislative Budget - Decision Items (cont.)

The Governor's FY26 Budget Request includes four decision items submitted by CDOT

- **R-03 SB 21-260 General Fund Transfers** - As part of statewide efforts across agencies to balance the State's budget, the Department requests to reduce the transfer to the State Highway Fund by $39.0 million in FY 2025-26 and by $24.5 million in FY 2026-27. Then the Department requests to shift out the funding to later dates to ensure CDOT stays whole as intended in SB 21-260.

- **R-04 Reduce Road Safety Surcharge** - As part of statewide efforts across agencies to help balance the State's budget, the Department proposes a reduction to the Road Safety Surcharge, resulting in a $65.1M decrease in state FASTER revenue subject to TABOR.

Line Number	One Sheet Budget Line	Initial Allocation	Updated Allocation	Change
10	10 Year Plan Projects - Capital AM	$76.1 M	$67.2 M	($8.9 M)
19	10 Year Plan Projects - Capital Mobility	$76.1 M	$40.8 M	($35.2 M)
46	10 Year Plan Projects - Multimodal	$16.9 M	$12.0 M	($4.9 M)
48	Bustang (General Fund only)	$0.0 M	$10.0 M	$10.0 M
n/a	**Total Impact of R-03**	**$169.1 M**	**$130.0 M**	**($39.0 M)**

Line Number	One Sheet Budget Line	Initial Allocation	Updated Allocation	Net Change
1	Surface Treatment*	$233.0 M	$223.2 M	($9.8 M)
2	Structures*	$63.4 M	$55.8 M	($7.6 M)
3	System Operations*	$27.3 M	$23.3 M	($4.0 M)
4	Geohazards Mitigation*	$9.7 M	$5.0 M	($4.7 M)
15	FASTER Safety	$80.5 M	$41.5 M	($39.0 M)
n/a	**Total Impact of R-04**	**$413.9 M**	**$348.8 M**	**($65.1 M)**

*Per PD 704.0, a portion of FASTER Safety revenue is used for the Asset Management Program. These lines are partially funded with FASTER funds, and the remainder is flexible FHWA funds.

Status on Legislative Budget

- CDOT's hearing with the Joint Budget Committee (JBC) was held on December 10, 2024
- The 2025 Legislative Session starts on January 8, 2025
- JBC votes to adopt the budget for appropriated lines in the Long Bill in a process called Figure Setting, which is typically held in late February or early March.
- The Long Bill is typically introduced in early April for consideration and adoption by the full General Assembly.
- Legislation impacting CDOT may be introduced throughout the session that ends in May 2025.

We anticipate amending the FY26 Annual Budget after session to:

1. make adjustments based on outcomes of CDOT Decision Items including budget reduction Decision Items;
2. incorporate additional funding if any legislative funding measures pass.

Additional Adjustments Coming

Still to come….

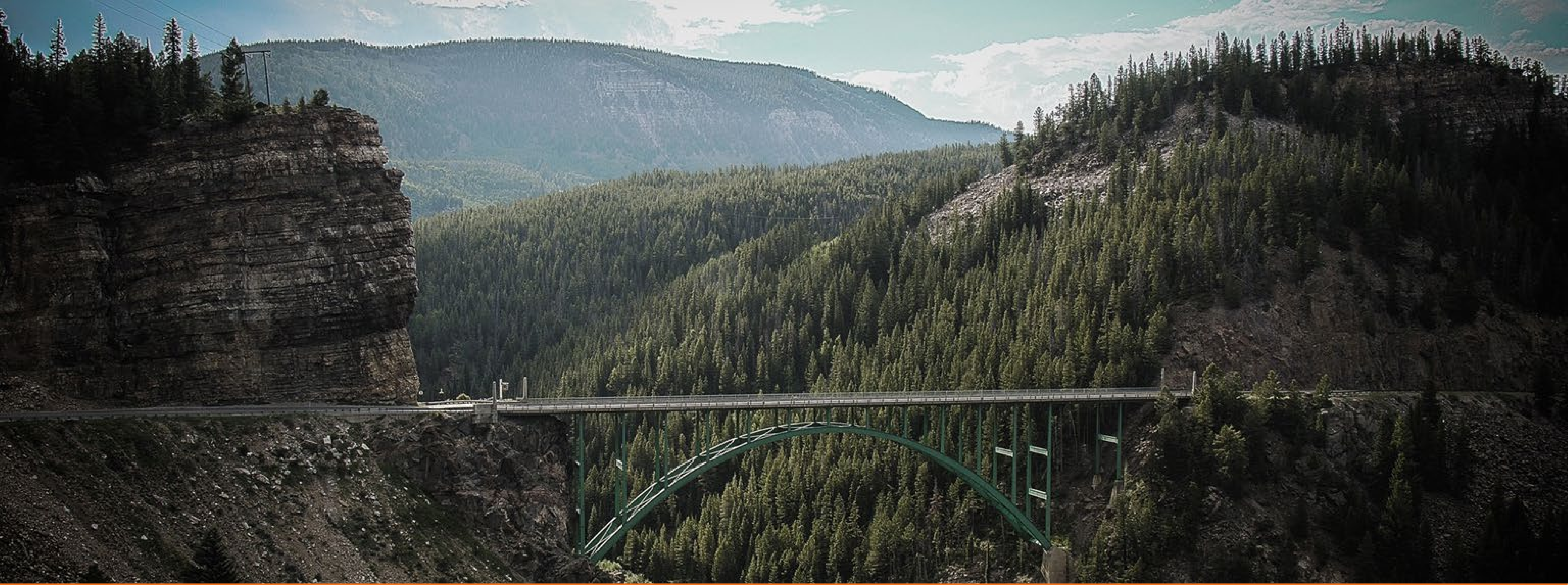
- **Legislative Changes:** Staff will closely monitor proposed legislation that is introduced during the 2025 legislative session and assess whether any proposals under consideration will have an impact on the FY 2025-26 CDOT budget.
- **Updates to Capital Construction Allocations:** The TC will have an opportunity to consider changes to capital construction program allocations, as discussed above, ***including offsetting impacts to the FASTER Safety program***.
- **Decision Items:** The TC will have an opportunity to review any potential Decision Item requests during the February 2025 Budget Workshop, prior to the March adoption of the Final FY 2025-26 Annual Budget Allocation Plan.
- **Administration (Line 67):** Legislative and OSPB actions during the budget development cycle may require further changes in Administration spending for CDOT. The Administration number will be updated throughout the fall and winter.
- **Maintenance Reserve (Line 36) and Contingency Reserve (Lines 72 and 73):** After final adjustments for common policy, etc., and consideration of current balances in Maintenance and Contingency Reserve Funds, the Commission may also be asked to consider options for the allocation of any residual flexible HUTF funding or flexible federal funding, including amounts currently allocated to the Maintenance and Contingency Reserve lines, to other programs including the 10-Year Plan, Maintenance Program Areas, or other asset management programs.

Timeline and Next Steps

DAF will continue to address the following items for the FY 2025-26 Annual Budget:

- February 2025: Staff will update the TC on legislative proposals submitted with the Governor's Budget Request, and any other legislative proposals that may impact the CDOT budget.
- February 2025: The TC will be asked to review and approve any decision items of $1 million or more, and additional changes as necessary.
- March 2025: The TC will be asked to review and adopt the FY 2025-26 Final Annual Budget Allocation Plan.

US 550 - Silverton to Ouray



COLORADO
Department of Transportation

Questions?

Transportation Commission Memorandum

To: The Transportation Commission

From: Jeff Sudmeier, Chief Financial Officer

Bethany Nicholas, CDOT Budget Director

Date: January 15, 2025

Subject: Fiscal Year (FY) 2024-25 Budget Amendment

Purpose

To review the fifth budget amendment to the FY 2024-25 Annual Budget in accordance with Policy Directive (PD) 703.0.

Action

The Division of Accounting and Finance (DAF) is requesting the Transportation Commission (TC) to review and adopt the fifth budget amendment to the FY 2024-25 Annual Budget, which consists of one item that requires TC approval. The fifth budget amendment:

1. Reallocates $5,352,000 from the TC Program Reserve Fund in the Commission Reserve Funds line (Line 73) to the Geohazards Mitigation line (Line 7) to provide state match for the statewide avalanche mitigation project.

Budget Amendment

The fifth budget amendment contains one item that requires TC approval. If this amendment is approved, the net impact to the TC Program Reserve is a reduction of $5,352,000 resulting in a balance of $50.0 million.

State-Wide Avalanche Mitigation Project

Staff is requesting to transfer $5,352,000 from the TC Program Reserve Fund in the Commission Reserve Funds line (Line 73) to the Geohazards Mitigation line (Line 7) in order to advance CDOT's efforts to pursue discretionary federal grant funding through the Promoting Resilient Operations for Transformative, Efficient, and Cost-saving Transportation Program (PROTECT).

Signed in 2021, the Infrastructure Investment and Jobs Act (Bipartisan Infrastructure Law or BIL) established the PROTECT program to provide grant funding, on a competitive basis, to ensure surface transportation resilience to natural hazards including climate change, sea level rise, flooding, extreme weather events, and other natural disasters through support of planning activities, resilience improvements, community resilience and evacuation routes, and at-risk coastal infrastructure. The

PROTECT program is administered by the Federal Highway Administration (FHWA). CDOT is pursuing this funding through multiple grants, including the State-Wide Avalanche Mitigation (SWAP) Project, which will support necessary technology investment to transition CDOT crews from utilizing World War II-era Howitzers to more cost-efficient, time-efficient, and environmentally-sustainable RACS; perform a small slope study to identify best mitigation strategies for smaller slopes such as Berthoud Pass; and the procurement of five truck mounted rotary snow blowers.

In the event that CDOT is not awarded the discretionary PROTECT grant for this project, the $5.4 million will be retained and used in order to advance avalanche mitigation efforts.

Next Steps

January 2025 - Staff will complete any actions for approved budget amendments.

Attachments

Attachment A - Amended FY 2024-25 Revenue Allocation Plan
Attachment B – Presentation

Attachment A: Fiscal Year (FY) 2024-25 CDOT Amended Annual Budget (January 2025)

Line	Budget Category / Program	Rollforward from FY 2023-24	FY 2024-25 Final Allocation Plan	Proposed TC Amendments	Approved TC Amendments	EMT and Staff Approved Adjustments	Total FY25 Program Budget Available including Changes	Directed By	Funding Source
1	**Colorado Department of Transportation (CDOT)**								
2	**Capital Construction**	**$1,307.9 M**	**$717.0 M**	**$5.4 M**	**-$8.0 M**	**$220.1 M**	**$2,242.4 M**	-	-
3	**Asset Management**	**$272.2 M**	**$423.5 M**	**$5.4 M**	**$0.6 M**	**-$8.2 M**	**$693.6 M**	-	-
4	Surface Treatment	$46.8 M	$229.0 M	$0.0 M	$0.0 M	$1.2 M	$277.0 M	TC	FHWA / SH / SB 09-108
5	Structures	$90.1 M	$63.4 M	$0.0 M	$0.0 M	$0.4 M	$153.9 M	TC	FHWA / SH / SB 09-108
6	System Operations	$6.3 M	$27.3 M	$0.0 M	$0.0 M	-$0.2 M	$33.4 M	TC	FHWA / SH
7	Geohazards Mitigation	$7.9 M	$9.7 M	$5.4 M	$0.0 M	$0.0 M	$23.0 M	TC	SB 09-108
8	Permanent Water Quality Mitigation	$1.1 M	$6.5 M	$0.0 M	$0.0 M	$0.0 M	$7.6 M	TC	FHWA / SH
9	Emergency Relief	$5.5 M	$0.0 M	$0.0 M	$0.0 M	-$5.2 M	$0.3 M	FR	FHWA
10	10 Year Plan Projects - Capital Asset Management	$114.6 M	$87.7 M	$0.0 M	$0.6 M	-$4.4 M	$198.5 M	TC / FR	FHWA
11	**Safety**	**$102.0 M**	**$132.0 M**	**$0.0 M**	**-$9.7 M**	**$17.2 M**	**$241.5 M**	-	-
12	Highway Safety Improvement Program	$42.0 M	$43.1 M	$0.0 M	$0.0 M	-$1.0 M	$84.1 M	FR	FHWA / SH
13	Railway-Highway Crossings Program	$0.3 M	$3.8 M	$0.0 M	$0.0 M	-$0.3 M	$3.8 M	FR	FHWA / SH
14	Hot Spots	$1.8 M	$2.7 M	$0.0 M	$0.0 M	-$0.1 M	$4.4 M	TC	FHWA / SH
15	FASTER Safety	$40.9 M	$75.2 M	$0.0 M	-$9.7 M	$18.6 M	$125.0 M	TC	SB 09-108
16	Americans with Disabilities Act Compliance	$16.9 M	$7.2 M	$0.0 M	$0.0 M	$0.0 M	$24.1 M	TC	FHWA / SH
17	**Mobility**	**$933.7 M**	**$161.5 M**	**$0.0 M**	**$1.1 M**	**$211.1 M**	**$1,307.4 M**	-	-
18	Regional Priority Program	$51.8 M	$50.0 M	$0.0 M	$1.7 M	-$1.9 M	$101.5 M	TC	FHWA / SH
19	10 Year Plan Projects - Capital Mobility	$858.3 M	$87.7 M	$0.0 M	-$0.6 M	$214.6 M	$1,160.0 M	SL	FHWA / SB 17-267 / SB 21-260
20	Freight Programs	$23.7 M	$23.8 M	$0.0 M	$0.0 M	-$1.6 M	$45.8 M	FR	FHWA / SH / SL
21	**Maintenance and Operations**	**$45.7 M**	**$405.1 M**	**$0.0 M**	**$10.8 M**	**$0.8 M**	**$461.9 M**	-	-
22	**Asset Management**	**$38.3 M**	**$368.5 M**	**$0.0 M**	**$10.8 M**	**$7.6 M**	**$424.7 M**	-	-
23	Maintenance Program Areas	$0.6 M	$297.9 M	$0.0 M	$0.0 M	$6.4 M	$304.3 M	-	-
24	Roadway Surface	$0.0 M	$41.7 M	$0.0 M	-$7.4 M	$0.0 M	$34.3 M	TC	SH
25	Roadside Facilities	$0.0 M	$23.8 M	$0.0 M	-$0.7 M	$0.0 M	$23.1 M	TC	SH
26	Roadside Appearance	$0.0 M	$11.9 M	$0.0 M	-$4.0 M	$0.0 M	$7.9 M	TC	SH
27	Structure Maintenance	$0.0 M	$6.0 M	$0.0 M	-$0.1 M	$0.0 M	$5.9 M	TC	SH
28	Tunnel Activities	$0.0 M	$6.0 M	$0.0 M	-$1.4 M	$0.0 M	$4.6 M	TC	SH
29	Snow and Ice Control	$0.0 M	$92.3 M	$0.0 M	$12.9 M	$0.0 M	$105.2 M	TC	SH
30	Traffic Services	$0.0 M	$77.4 M	$0.0 M	$0.6 M	$0.0 M	$78.0 M	TC	SH
31	Materials, Equipment, and Buildings	$0.0 M	$20.9 M	$0.0 M	-$1.0 M	$0.0 M	$19.9 M	TC	SH
32	Planning and Scheduling	$0.0 M	$17.9 M	$0.0 M	$1.1 M	$0.0 M	$19.0 M	TC	SH
33	Express Lane Corridor Maintenance and Operations	$3.5 M	$12.7 M	$0.0 M	$0.0 M	$0.1 M	$16.3 M	TC	SH
34	Property	$0.1 M	$22.7 M	$0.0 M	$2.8 M	$1.2 M	$26.7 M	TC	SH
35	Capital Equipment	$34.0 M	$23.3 M	$0.0 M	$0.0 M	$0.0 M	$57.4 M	TC	SH
36	Maintenance Reserve Fund	$0.0 M	$12.0 M	$0.0 M	$8.0 M	$0.0 M	$20.0 M	TC	SH
37	**Safety**	**$2.6 M**	**$12.2 M**	**$0.0 M**	**$0.0 M**	**-$6.6 M**	**$8.2 M**	-	-
38	Strategic Safety Program	$2.6 M	$12.2 M	$0.0 M	$0.0 M	-$6.6 M	$8.2 M	TC	FHWA / SH
39	**Mobility**	**$4.8 M**	**$24.4 M**	**$0.0 M**	**$0.0 M**	**-$0.2 M**	**$29.0 M**	-	-
40	Real-Time Traffic Operations	$0.2 M	$14.4 M	$0.0 M	$0.0 M	-$0.2 M	$14.4 M	TC	SH
41	Intelligent Transportation System Investments	$4.5 M	$10.0 M	$0.0 M	$0.0 M	$0.0 M	$14.6 M	TC	FHWA / SH
42	**Multimodal Services & Electrification**	**$233.6 M**	**$57.1 M**	**$0.0 M**	**$0.0 M**	**$2.9 M**	**$293.5 M**	-	-
43	**Mobility**	**$233.6 M**	**$57.1 M**	**$0.0 M**	**$0.0 M**	**$2.9 M**	**$293.5 M**	-	-
44	Innovative Mobility Programs	$18.5 M	$9.3 M	$0.0 M	$0.0 M	$0.0 M	$27.8 M	TC	FHWA / SH
45	National Electric Vehicle Program	$14.5 M	$14.5 M	$0.0 M	$0.0 M	$0.0 M	$29.0 M	FR	FHWA
46	10 Year Plan Projects - Multimodal	$131.1 M	$19.5 M	$0.0 M	$0.0 M	$1.8 M	$152.4 M	TC	FHWA / SB 17-267, SB 21-260
47	Rail Program	$14.1 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$14.1 M	SL	SL
48	Bustang	$55.4 M	$13.7 M	$0.0 M	$0.0 M	$1.1 M	$70.2 M	TC	SB 09-108 / Fare Rev. / SB 21-260
49	**Suballocated Programs**	**$659.4 M**	**$327.5 M**	**$0.0 M**	**$0.0 M**	**-$19.0 M**	**$967.8 M**	-	-
50	**Aeronautics**	**$37.5 M**	**$57.4 M**	**$0.0 M**	**$0.0 M**	**-$11.5 M**	**$83.4 M**	-	-
51	Aviation System Program	$37.5 M	$57.4 M	$0.0 M	$0.0 M	-$11.5 M	$83.4 M	AB	SA
52	**Highway**	**$239.2 M**	**$155.4 M**	**$0.0 M**	**$0.0 M**	**-$17.9 M**	**$376.6 M**	-	-
53	Surface Transportation Block Grant - Urban	$127.2 M	$66.9 M	$0.0 M	$0.0 M	-$11.7 M	$182.4 M	FR	FHWA / LOC
54	Congestion Mitigation and Air Quality	$73.6 M	$53.8 M	$0.0 M	$0.0 M	-$6.0 M	$121.5 M	FR	FHWA / LOC
55	Metropolitan Planning	$1.2 M	$12.1 M	$0.0 M	$0.0 M	$0.3 M	$13.6 M	FR	FHWA / FTA / LOC
56	Off-System Bridge Program	$37.2 M	$22.5 M	$0.0 M	$0.0 M	-$0.6 M	$59.0 M	TC / FR	FHWA / SH / LOC
57	**Transit and Multimodal**	**$382.6 M**	**$114.7 M**	**$0.0 M**	**$0.0 M**	**$10.4 M**	**$507.7 M**	-	-
58	Recreational Trails	$1.3 M	$1.6 M	$0.0 M	$0.0 M	-$1.2 M	$1.7 M	FR	FHWA
59	Safe Routes to School	$9.5 M	$3.1 M	$0.0 M	$0.0 M	-$0.1 M	$12.5 M	TC	FHWA / LOC
60	Transportation Alternatives Program	$46.1 M	$22.8 M	$0.0 M	$0.0 M	-$3.2 M	$65.7 M	FR	FHWA / LOC
61	Transit Grant Programs	$160.6 M	$53.9 M	$0.0 M	$0.0 M	$1.0 M	$215.5 M	FR/SL/TC	FTA / LOC / SB 09-108
62	Multimodal Options Program - Local	$121.0 M	$16.4 M	$0.0 M	$0.0 M	$15.3 M	$152.7 M	SL	SB 21-260
63	Carbon Reduction Program - Local	$12.3 M	$9.9 M	$0.0 M	$0.0 M	-$0.6 M	$21.6 M	FR	FHWA / LOC
64	Revitalizing Main Streets Program	$31.7 M	$7.0 M	$0.0 M	$0.0 M	-$0.8 M	$37.9 M	SL / TC	SB 21-260
65	**Administration & Agency Operations**	**$10.3 M**	**$128.0 M**	**$0.0 M**	**$5.2 M**	**$2.3 M**	**$145.8 M**	-	-
66	Agency Operations	$9.5 M	$77.5 M	$0.0 M	$4.1 M	$1.4 M	$92.5 M	TC / AB	FHWA / SH / SA / SB 09-108
67	Administration	$0.0 M	$48.8 M	$0.0 M	$1.1 M	$0.0 M	$49.9 M	SL	SH
68	Project Initiatives	$0.8 M	$1.7 M	$0.0 M	$0.0 M	$0.9 M	$3.4 M	TC	SH
69	**Debt Service**	**$140.3 M**	**$44.5 M**	**$0.0 M**	**$0.0 M**	**-$7.1 M**	**$177.7 M**	-	-
70	Debt Service	$140.3 M	$44.5 M	$0.0 M	$0.0 M	-$7.1 M	$177.7 M	DS	SH
71	**Contingency Reserve**	**$25.8 M**	**$15.0 M**	**-$5.4 M**	**-$7.9 M**	**$49.2 M**	**$76.8 M**	-	-
72	Contingency Fund	$6.8 M	$15.0 M	$0.0 M	-$1.7 M	$0.0 M	$20.1 M	TC	FHWA / SH
73	Commission Reserve Funds	$19.1 M	$0.0 M	-$5.4 M	-$6.3 M	$49.2 M	$56.7 M	TC	FHWA / SH
74	**Other Programs**	**$51.2 M**	**$34.6 M**	**$0.0 M**	**$0.0 M**	**$3.0 M**	**$88.7 M**	-	-
75	Safety Education	$36.5 M	$16.0 M	$0.0 M	$0.0 M	$1.1 M	$53.6 M	TC/FR	NHTSA / SSE
76	Planning and Research	$5.4 M	$17.7 M	$0.0 M	$0.0 M	-$0.8 M	$22.3 M	FR	FHWA / SH
77	State Infrastructure Bank	$9.2 M	$0.9 M	$0.0 M	$0.0 M	$2.7 M	$12.8 M	TC	SIB
78	**Total - CDOT**	**$2,474.1 M**	**$1,728.8 M**	**$0.0 M**	**$0.0 M**	**$252.3 M**	**$4,455.1 M**	-	-

79	Colorado Bridge & Tunnel Enterprise (BTE)								
80	Capital Construction	$26.1 M	$109.8 M	$0.0 M	-$18.6 M	$28.8 M	$146.1 M	-	-
81	Asset Management	$26.1 M	$109.8 M	$0.0 M	-$18.6 M	$28.8 M	$146.1 M	-	-
82	10-Year Plan Projects- BTE	$16.3 M	$11.4 M	$0.0 M	$25.2 M	$16.6 M	$69.4 M	BEB	SB 09-108, SB 21-260
83	Safety Critical and Asset Management Projects	$9.8 M	$98.4 M	$0.0 M	-$43.8 M	$12.3 M	$76.7 M	BEB	SB 09-108, SB 21-260
84	Maintenance and Operations	$0.5 M	$2.1 M	$0.0 M	$0.0 M	$0.0 M	$2.6 M	-	-
85	Asset Management	$0.5 M	$2.1 M	$0.0 M	$0.0 M	$0.0 M	$2.6 M	-	-
86	Maintenance and Preservation	$0.5 M	$2.1 M	$0.0 M	$0.0 M	$0.0 M	$2.6 M	BEB	SB 09-108
87	Administration & Agency Operations	$4.7 M	$2.4 M	$0.0 M	$0.0 M	-$0.2 M	$6.9 M	-	-
88	Agency Operations-BTE	$4.7 M	$2.4 M	$0.0 M	$0.0 M	-$0.2 M	$6.9 M	BEB	SB 09-108, SB 21-260
89	Debt Service	$0.3 M	$49.3 M	$0.0 M	$6.8 M	-$17.1 M	$39.3 M	-	-
90	Debt Service-BTE	$0.3 M	$49.3 M	$0.0 M	$6.8 M	-$17.1 M	$39.3 M	BEB	FHWA / SH
91	Total - Bridge & Tunnel Enterprise (BTE)	$31.5 M	$163.5 M	$0.0 M	-$11.8 M	$11.6 M	$194.9 M	-	-
92	Colorado Transportation Investment Office (CTIO)								
93	Maintenance and Operations-CTIO	$406.7 M	$123.4 M	$0.0 M	$0.0 M	$30.3 M	$560.4 M	-	-
94	Express Lanes Operations	$406.7 M	$123.4 M	$0.0 M	$0.0 M	$30.3 M	$560.4 M	HPTEB	Tolls / Managed Lanes Revenue
95	Administration & Agency Operations-CTIO	$3.1 M	$4.1 M	$0.0 M	$0.0 M	$0.0 M	$7.3 M	-	-
96	Agency Operations-CTIO	$3.1 M	$4.1 M	$0.0 M	$0.0 M	$0.0 M	$7.3 M	HPTEB	Fee for Service
97	Debt Service-CTIO	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	-	-
98	Debt Service-CTIO	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	HPTEB	Fee for Service
99	Total - Colorado Transportation Investment Office (CTIO)	$409.9 M	$127.4 M	$0.0 M	$0.0 M	$30.4 M	$567.6 M	-	-
100	Clean Transit Enterprise (CTE)								
101	Suballocated Programs	$0.0 M	$16.6 M	$0.0 M	$0.0 M	$0.0 M	$16.6 M	-	-
102	Transit and Multimodal	$0.0 M	$16.6 M	$0.0 M	$0.0 M	$0.0 M	$16.6 M	-	-
103	CTE Projects	$0.0 M	$16.6 M	$0.0 M	$0.0 M	$0.0 M	$16.6 M	CTB	SB 21-260
104	Administration & Agency Operations	$0.0 M	$1.6 M	$0.0 M	$0.6 M	$0.1 M	$2.3 M	-	-
105	Agency Operations-CTE	$0.0 M	$0.6 M	$0.0 M	$0.6 M	$0.1 M	$1.3 M	CTB	SB 21-260
106	Contingency Reserve-CTE	$0.0 M	$1.0 M	$0.0 M	$0.0 M	$0.0 M	$1.0 M	CTB	SB 21-260
107	Debt Service	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	-	-
108	Debt Service-CTE	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	CTB	SB 21-260
109	Total - Clean Transit Enterprise (CTE)	$0.0 M	$18.1 M	$0.0 M	$0.6 M	$0.1 M	$18.9 M	-	-
110	Nonattainment Area Air Pollution Mitigation Enterprise (NAAPME)								
111	Multimodal Services & Electrification	$17.1 M	$10.7 M	$0.0 M	$0.1 M	$2.0 M	$29.9 M	-	-
112	Mobility	$17.1 M	$10.7 M	$0.0 M	$0.1 M	$2.0 M	$29.9 M	-	-
113	NAAPME Projects	$17.1 M	$10.7 M	$0.0 M	$0.1 M	$2.0 M	$29.9 M	NAAPMEB	SB 21-260
114	Administration & Agency Operations	$0.3 M	$0.2 M	$0.0 M	-$0.1 M	$0.0 M	$0.4 M	-	-
115	Agency Operations-NAAPME	$0.1 M	$0.2 M	$0.0 M	-$0.1 M	$0.0 M	$0.2 M	NAAPMEB	SB 21-260
116	Contingency Reserve-NAAPME	$0.2 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.2 M	NAAPMEB	SB 21-260
117	Debt Service	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	-	-
118	Debt Service-NAAPME	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	NAAPMEB	SB 21-260
119	Total - Nonattainment Area Air Pollution Mitigation Enterprise (NAAPME)	$17.5 M	$10.9 M	$0.0 M	$0.0 M	$2.0 M	$30.4 M	-	-
120	Fuels Impact Enterprise (FIE)								
121	Suballocated Programs	$0.0 M	$14.8 M	$0.0 M	$0.0 M	$0.0 M	$14.8 M	-	-
122	Highway	$0.0 M	$14.8 M	$0.0 M	$0.0 M	$0.0 M	$14.8 M	-	-
123	Fuels Impact Grants	$0.0 M	$14.8 M	$0.0 M	$0.0 M	$0.0 M	$14.8 M	FIEB	SB 23-280
124	Administratin & Agency Operations	$0.0 M	$0.2 M	$0.0 M	$0.0 M	$0.0 M	$0.2 M	-	-
125	Agency Operations-FIE	$0.0 M	$0.2 M	$0.0 M	$0.0 M	$0.0 M	$0.2 M	FIEB	SB 23-280
126	Contingency Reserve-FIE	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	FIEB	SB 23-280
127	Debt Service	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	-	-
128	Debt Service-FIE	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	FIEB	SB 23-280
129	Total - Fuels Impcat Enterprise (FIE)	$0.0 M	$15.0 M	$0.0 M	$0.0 M	$0.0 M	$15.0 M	-	-
130	Total - CDOT and Enterprises	$2,932.9 M	$2,063.8 M	$0.0 M	-$11.2 M	$296.3 M	$5,281.9 M	-	-

* Roll forward budget is budget from a prior year that hasn't been committed to a project or expended from a cost center prior to the close of the fiscal year.

Key to Acronyms:
- = Empty Cell With No Applicable Data or Description
AB = Aeronautics Board
BEB = Bridge Enterprise Board
CTB = Clean Transit Board
DS = Debt Service
FR = Federal
HPTEB = High Performance Transportation Enterprise Board
LOC = Local
M = millions in dollar amount
NAAPMEB = Nonattainment Area Air Pollution Mitigation Enterprise Board
SA = State Aviation
SB = Senate Bill
SH = State Highway
SIB = State Infrastructure Bank
SL = State Legislature
TC = Transportation Commission

COLORADO
Department of Transportation

January 2025 Budget Workshop
FY 2024-25 Budget Amendment

Agenda

Agenda:

- FY25 Budget Amendment Summary
- Budget Amendment Description:
    - Statewide Avalanche Mitigation Project

Colorado Mountains

FY25 Budget Amendment Summary

The total request from the TC's Program Reserve Fund: $5.4 M

Description	Amount	Budget Line from	Budget Line to
Statewide Avalanche Mitigation Project	$5,352,000	Commission Reserve Funds (Line 73)	Geohazards Mitigation (Line 7)

If this request is approved, the remaining balance in the TC Program Reserve Fund will be $50.0 M

Background

Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT)

- A grant program established by the Infrastructure Investment and Jobs Act
- FY 2024 - 2025 has $576 million of grant funding available for eligible projects
- The grant's purpose is **strengthen transportation infrastructure resilience** to natural hazards, including climate change, sea level rise, flooding, heat waves, extreme weather events, and other natural disasters

State-Wide Avalanche Protocol (SWAP)

The Project will:

- Provide the necessary funding to modernize our avalanche mitigation technology from WWII howitzer cannons to Remote Avalanche Control Systems (RACs);
- Perform a small slope study to identify best tactics for slopes like Berthoud pass;
- Support faster debris removal equipment
- Supports statewide transportation system resilience efforts

PROTECT grant request: $21,408,000

Process

State match

- PROTECT requires a 80/20 split between the grant award and non-federal matching funds
- Therefore, SWAP requires a non-federal match of $5,352,000
- In the event that CDOT does not succeed in grant award, the $5.4M funds will be retained in order to advance avalanche mitigation efforts

Next Steps

Next Steps:

- January 2025 – Staff will complete any actions for approved budget amendments.

Transportation Commission Memorandum

To: Fuels Impact Enterprise Board of Directors
From: Darius Pakbaz, FIE Program Administrator
Craig Hurst, Manager, Freight Mobility & Safety Branch
Erica Denney, Freight Planner, Freight Mobility & Safety Branch
Date: January 15, 2025

Subject: Fuels Impact Enterprise Program and Budget Update - January 2025

Purpose

The purpose of this memorandum is to provide an overview of the Fuels Impact Enterprise, the fiscal year 2024-25 budget, and to discuss the next steps in the grant program.

Action

No action required at this time. Potential action on budget amendments for the fiscal year 2024-25 budget at a future board meeting.

Background

Senate Bill 23-280, signed into law on June 6, 2023, established the Fuels Impact Enterprise within the Colorado Department of Transportation. This enterprise is tasked with improving the transportation of fuel and motor vehicle emissions. To allow the enterprise to accomplish this business purpose and fully exercise its powers and duties, the enterprise may:

- Impose a fuels impact reduction fee as authorized by C.R.S. 43-4-1505(1),
- Issue grants as authorized by the fuels impact reduction grants program created in section 43-4-1506; and
- Issue revenue bonds payable from fuels impact reduction fee revenue and other available money of the enterprise.

To carry out its duties and its business enterprise, the enterprise adopted a fuels impact reduction fee per gallon, beginning on September 1, 2023, to be paid by licensed fuel excise tax distributors within Colorado and licensed fuel distributors who ship products from outside of Colorado to a point within Colorado. This fee cannot be more than six thousand one hundred twenty-five millionths of a dollar ($0.006125) per gallon of fuel products delivered for sale or use in Colorado.

The enterprise is tasked to administer the fuels impact reduction grant program, to provide grants to certain critically impacted communities, governments and transportation corridors for the improvement of hazardous mitigation corridors and to support local and state government projects related to emergency responses, environmental mitigation, or projects related to transportation fuel within the state. C.R.S. 43-4-1506 (2) requires the distribution of the first $10 million of funds from the grant program to the following:

- $6,400,000 to Adams County (64%)
- $2,000,000 to the City of Aurora (20%)
- $1,300,000 to El Paso County (13%)
- $240,000 to Mesa County (2.4%)
- $60,000 to Otero County (0.6%)

Additionally, the enterprise can distribute up to five million dollars ($5 million) from the fund, after the transfers outlined above and after providing for administrative expenses of the enterprise, to commercial freight corridors, support state government projects related to emergency responses, environmental mitigation, or support projects related to the transportation of fuel within the state on routes necessary for the transportation of hazardous materials.

If the fund balance of the cash fund for the enterprise exceeds $15 million, the fuels impact reduction fee will not be collected.

As defined in 43-4-1503 (1)(b), the Colorado Transportation Commission shall also serve as the Fuels Impact Enterprise Board of Directors and the enterprise will end its existence on January 1, 2030, and defined in C.R.S. 43-4-1507.

The Board of Directors are being asked to review and provide feedback on the fiscal year 2024-25 budget as it is broken down into revenues, allocations and expenses, and administrative and operating activities. During revenue reconciliation of the fiscal year 2024 funds, additional, unobligated funds were collected and staff is asking for direction from the Board of Directors on how to distribute these funds.

Next Steps

Based on discussion at the January 2025 workshop, staff will bring forward an amendment to the fiscal year 2024-25 budget based on the board’s preference of options. Additionally, future action will be taken on finalization of the fiscal year 2026 budget, consideration of usage of funds by the board, and execution of intergovernmental agreements with local entities.

Attachments

Attachment A - Fuels Impact Enterprise Overview Presentation
Attachment B - Fuels Impact Enterprise FY2024-25 Budget Draft

COLORADO
Department of Transportation

Fuels Impact Enterprise

Darius Pakbaz - DTD Director
Craig Hurst - DTD Freight Mobility & Safety Branch Manager

SB 23-280
Hazardous Materials Mitigation

- Signed into law on June 6, 2023
- Established the Fuels Impact Enterprise
- Imposed the Fuels Impact Reduction Fee and Grant Program
- Extends the fee schedule of the Petroleum Storage Tank Fund ($25 per tank truckload) until September 1, 2030.
- Additional Petroleum Regulations to be carried out by the Department of Labor and Employment (CDLE)

Fuels Impact Enterprise
General Overview

Officially Created on August 8, 2023; expires on January 1, 2030

Business Purpose: **Improve the Transportation of Fuel and Monitor Vehicle Emissions**

Enterprise Governance: The Colorado Transportation Commission shall serve as the Fuels Impact Enterprise Board of Directors

Enterprise Powers:

- Impose a fuel impact reduction fee
- Issue grants authorized by the fuels impact reduction grant program
- Issue bonds payable from fuels impact reduction fee revenue and other available money of the enterprise.
- Provide services set forth in C.R.S. 43-4-1506
- Other powers as implied by statute.

Fuels Impact Reduction Fee

As detailed in C.R.S. 43-4-1503, the Fuels Impact Enterprise Board was required to set the fuels impact reduction fee by September 1, 2023.

The fee was set by the Enterprise Board of Directors at **six thousand one hundred twenty-five millionths of a dollar ($0.006125) per gallon** of fuel products delivered for sale or use in Colorado.

This fee will be paid by licensed fuel excise tax distributors within Colorado and licensed fuel distributors who ships products from outside of Colorado to a point within Colorado.

The fee will not be collected if the fuels impact cash fund exceeds **$15 million dollars.**

Fuels Impact Reduction Grant Program
C.R.S. 43-4-1506

Fuels Impact Reduction Grant Program
$15 million

First "Allocation"
$10 million
Allocation to Specific Local Governments

Second "Allocation"
$5 million
Enterprise Administration

The Enterprise will be tasked with administration of the Fuel Impact Reduction Grant Program. Its purpose is to provide grants to certain impacted communities, governments, and transportation corridors for:

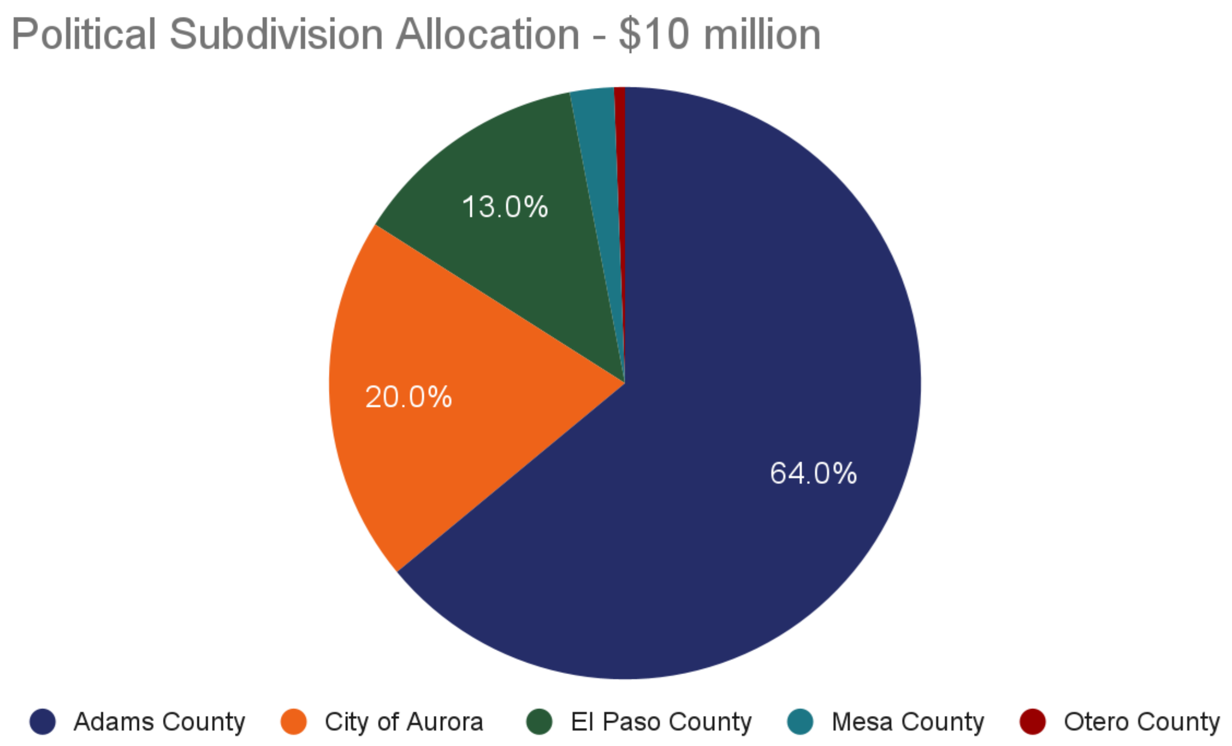
- Hazardous Mitigation Corridors
- Support Local and state products
  - Emergency Responses
  - Environmental Mitigation
  - Projects related to transportation of fuel within Colorado

Fuels Impact Reduction Grant Program

Political Subdivision Allocation - $10 million

The first allocation of funds, as required by statute, are to the following political subdivisions for the improvement of hazardous mitigation corridors in the state prioritizing uses related to safety and environmental impacts.

- Adams County - $6,400,000 - 64%
- City of Aurora - $2,000,000 - 20%
- El Paso County - $1,300,000 - 13%
- Mesa County - $240,000 - 2.4%
- Otero County - $60,000 - 0.6%



If the enterprise is unable to distribute $10 million, funds will be distributed in proportion described above.

If a political subdivision is unable to accept these funds, unacceptable amounts will be distributed to the other political subdivisions on a proportionate basis.

Fuels Impact Reduction Grant Program
FI Enterprise Administered Funds

The enterprise can allocate $5 million dollars from the fuels impact cash fund, after the initial transfers to political subdivisions, and after providing for administrative expenses, to the enterprise for the following:

- Commercial Freight Corridors;
- State government projects related to emergency responses;
- State government projects related to environmental mitigation; or
- Support projects related to the transportation of fuel within the state on routes necessary for the transportation of hazardous materials.

Fuels Impact Enterprise FY24-25 Revenues

Fiscal Year 2024-25 Revenues	
Revenue Source	**Revenues**
FY2023-24 Annual Distribution Obligation Roll Forward	$ 10,000,000
FY2023-24 Remaining Distribution and Operating Roll Forward	$ 1,249,947
FY2023-24 Revenue Reconciliation	$ 5,211,363
FY2024-25 Fuels Impact Reduction Fee Revenue	$ 15,000,000
Total Available Revenue	**$ 31,461,310**

Fuels Impact Enterprise FY24-25 Annual Allocations

Annual Distributions (Cost Center FUELS-548)	
Distribution Line Item	**Total**
Adams County FY24 & FY25 Statutory Distribution	$ 12,800,000
City of Aurora FY24 & FY25 Statutory Distribution	$ 4,000,000
El Paso County FY24 & FY25 Statutory Distribution	$ 6,000,000
Mesa County FY24 & FY25 Statutory Distribution	$480,000
Otero County FY24 & FY25 Statutory Distribution	$60,000
Board Directed Statewide Hazmat and Freight Projects FY24 & FY25 Statutory Distribution	$ 10,000,000
Total Available Distributions	**$ 30,000,000**

Fuels Impact Enterprise FY24-25 Administrative and Operating Activities

Administrative & Operating Activities (Cost Center FI280-548)		
Fuels Impact Enterprise Personnel Salary & Benefits		$ (100,000)
Fuels Impact Enterprise Staff Compensation		$ (20,000)
Fuels Impact Enterprise Program Support		$ (10,000)
Attorney General's Office Legal Services		$ (1,000)
Annual Audit		$ (2,000)
Travel Expenses		$ (500)
Operating Expenses		$ (1,000)
Board Contingency Reserve		$(100,000)
Total Administrative & Operating Activities Expenses		**$ (234,500)**

Fuels Impact Enterprise FY24-25 Revenue Reconciliation

- Revenue reconciliation from FY2024 was completed.
    - $1,226,810 of Fuels Impact Fee remains unobligated
    - Statute is silent on procedure for unobligated funds and direction is needed by the Board of Directors on usage.
- Options
    - Option 1 - Distribute $1,226,810 to local agencies already receiving grants from the FIE, according to the formula in statute.
    - Option 2 - Distribute $1,226,810 to the Board Directed Statewide Hazmat and Freight Projects.

Fuels Impact Enterprise Current Activities

- Staff has been working on getting IGAs completed for initial distributions to locals from Fiscal Year 2024.
  - Agreements being developed by Division of Accounting & Finance, working with locals.
- Enterprise Staff will be working with local entities on usage of funds and providing assistance as needed.
- Future Board of Directors workshop will outline potential projects or concepts for use of Enterprise funds.

Next Steps & Questions?

COLORADO
Department of Transportation

Next Steps

- Over the next several weeks, the DTD team that is supporting the Fuels Impact Enterprise will be working with the four counties and Aurora to finalize the intergovernmental agreements necessary to for the distribution of these funds to occur.
- Amendment of Fiscal Year 2025 Budget with revenue reconciliation and fund allocations. Fiscal Year 2026 Budget Adoption in March.
- The CDOT Freight team will work with stakeholders to develop a list of recommended project options to bring back to the board for decisions on how to distribute the board’s portion of this revenue.

Fuels Impact Enterprise

Fuels Impact Reduction Fund 548

Fiscal Year 2024-25 Annual Budget Draft

	Fiscal Year 2024-25 Revenues		
Line	Revenue Source	Revenues	
1	FY2023-24 Annual Distribution Obligation Roll Forward	$ 10,000,000	
2	FY2023-24 Remaining Distribution and Operating Roll Forward	$ 1,249,947	
3	FY2023-24 Revenue Reconciliation	$ 5,211,363	
4	FY2024-25 Fuels Impact Reduction Fee Revenue	$ 15,000,000	
5	**Total Available Revenue**	**$ 31,461,310**	
6			
	Fiscal Year 2024-25 Allocations and Expenses		
Line	**Budget Item**	**Allocation**	**Expenses**
7	**Annual Distributions (Cost Center FUELS-548)**	**$ 30,000,000**	
8	Adams County FY24 Distribution		$ (6,400,000)
9	City of Aurora FY24 Distribution		$ (2,000,000)
10	El Paso County FY24 Distribution		$ (1,300,000)
11	Mesa County FY24 Distribution		$ (240,000)
12	Otero County FY24 Distribution		$ (60,000)
13	Adams County FY25 Distribution		$ (6,400,000)
14	City of Aurora FY25 Distribution		$ (2,000,000)
15	El Paso County FY25 Distribution		$ (1,300,000)
16	Mesa County FY25 Distribution		$ (240,000)
17	Otero County FY25 Distribution		$ (60,000)
18	Board Directed Hazmat and Freight FY24 Distribution		$ (5,000,000)
19	Board Directed Hazmat and Freight FY25 Distribution		$ (5,000,000)
20			
21	**Total Annual Distributions Expenses**		**$ (30,000,000)**
22			
23	**Administrative & Operating Activities (Cost Center FI280-548)**	**$ 134,500**	
24	Fuels Impact Enterprise Personnel Salary & Benefits		$ (100,000)
25	Fuels Impact Enterprise Staff Compensation		$ (20,000)
26	Fules Impact Enterprise Program Support		$ (10,000)
27	Attorney General's Office Legal Services		$ (1,000)
28	Annual Audit		$ (2,000)
29	Travel Expenses		$ (500)
30	Operating Expenses		$ (1,000)
31			
32	**Total Administrative & Operating Activities Expenses**		**$ (134,500)**
33			
34	**Debt Service**	**$ -**	
35			
36	**Total Debt Service Expenses**		**$ -**
37			
38	**Contingency Reserve (Cost Center FI300-548)**	**$ 100,000**	
39			
40	**Total Contingency Reserve Expenses**		**$ -**
41			
	Total Revenue		**$ 31,461,310**
	Total Obligations		**$ (30,234,500)**
	Total Available Fund Balance Per §43-4-1504 (1)(b)(II) CRS*		**$ 1,226,810**

*held in FUELS-548 and does not factor in costs incurred by DOR in collecting the revenue

To: The Transportation Commission

From: San Lee, State Traffic Engineer; Benjamin Acimovic, Traffic Operations and Technology Manager

Date: January 15, 2025

Subject: CDOT Speed Safety Camera Program

Purpose
To provide an overview of the CDOT Speed Safety Camera Program that is scheduled to begin in the Spring of 2025.

Action
No action is required at this time.

CDOT Speed Safety Camera Program Background
Colorado Revised Statute 42-4-110.5 was revised in July of 2024 and enabled CDOT to administer a Speed Safety Camera Program. The statute and FHWA use different terminologies when referring to automated speed safety cameras, as shown below.

- Statute definition:
  - An AVIS is, as defined by C.R.S. 42-4-110.5, an automated vehicle identification (AVI) system, a machine used to automatically detect a violation of traffic regulations and simultaneously record a photograph of the vehicle and the license plate of the vehicle.
  - An AVIS is a temporary, mobile, or permanent system used to detect speeding violations within a highway maintenance, repair, construction zone, school zone, next to a park, or within an AVI Corridor.
  - An AVI Corridor is a designated street or portion of a street that a county or municipality, by ordinance or by a resolution of its governing body, defined as an AVI Corridor on which an AVI system may be located to detect violations of a county or municipal traffic regulation or a traffic violation under state law, specifically for speed violations.
- FHWA definition:
  - AVIS is a Colorado legal term for automated speed photo enforcement that is also synonymous with Speed Safety Cameras as defined by the Federal Highway Administration (FHWA). Speed Safety Cameras are a FHWA Proven Safety Countermeasure and have been deployed by Washington, Maryland, Connecticut, Washington D.C., and Pennsylvania and piloted in a dozen other states.

Per C.R.S 42-4-110.5, CDOT may deploy speed safety cameras on any State, United States, or Interstate Highway. Local agencies shall request approval from CDOT and the Colorado State Patrol to implement automated speed enforcement as designated by local agency ordinances on all areas along state and US highways. Eligible areas for automated speed enforcement include:

- School zones;
- maintenance, repair, or, work zones;
- by municipal parks or
- within AVI corridors.

CDOT's overall Speed Safety Program goals are (CDOT is focusing on work zones first):

- To reduce crashes within work zones,
- To reduce travel speeds along identified work zones first, school zones and AVIS corridors as allowed by statute, and
- To reduce crash severity.

The benefits of a Speed Safety Camera Program are:

- Increase safety for officers and the traveling public by allowing enforcement at locations that might be too dangerous for traditional traffic stops.
- Reduce congestion that may result from traditional traffic stops or from speeding-related crashes.
- Reduce secondary crashes associated with congestion caused by traffic stops or speeding-related crashes.
- The program generates a high rate of speeding violation detections and citations, which may provide greater deterrence of speeding.

CDOT's Speed Safety Program includes

- CDOT is administering its Speed Safety Camera program and deployments.
- A vendor (Blissway) issues warnings, violations, and civil assessments through their system.
- A developed dispute and hearing process that registered owners of vehicles can easily navigate.
- Colorado State Patrol as a partner reviewing Local Agency requests for Speed Safety Cameras.
- Local agencies administer their own programs and deployments with CSP and CDOT approval on State and U.S. Highways.

Next Steps

- In February 2025, Emergency Administrative Rules are required to start enforcement on state, United States, and Interstate highways. A draft of the Speed Safety Camera Program Administrative rules will be available for review by the end of January 2025.
- CDOT will complete a Speed Safety Camera program in January 2025 and begin public outreach in February 2025. The main media blitz will begin in March 2025 with the first Speed Safety Camera deployment on the I-70 Floyd Hill Construction Project in Region 1.
- CDOT plans to roll out Speed Safety Cameras in work zones from March 2025 through November 2025, starting with up to five pilot work zones. CDOT's focus is on work zones first and then other areas as allowed by statute.

Attachments

Attachment A – Presentation

COLORADO
Department of Transportation

CDOT Speed Safety Camera Program
Transportation Commission Workshop
January 15, 2025

Legislation and Background

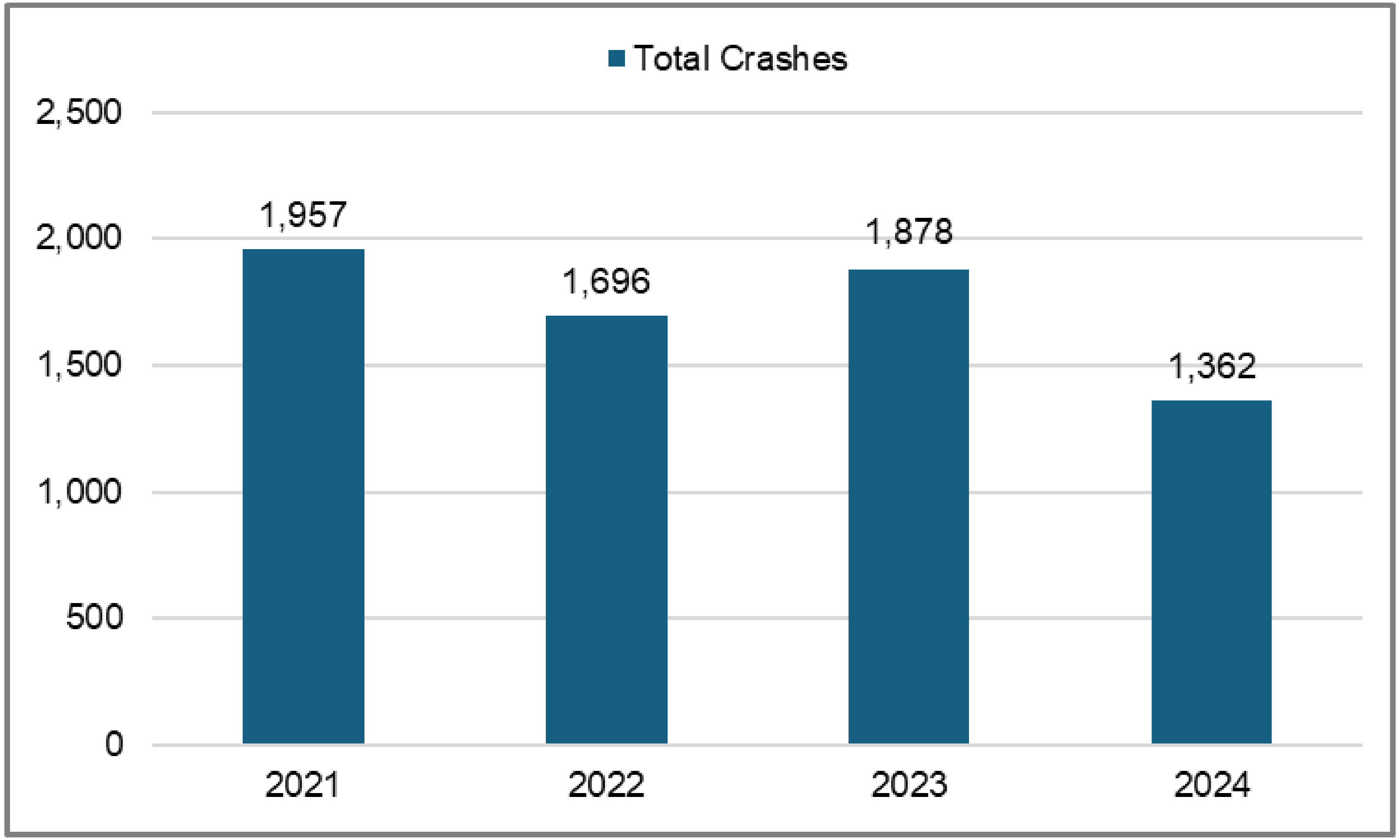
CRS 42-4.110.5 allows for Speed Safety Cameras (SSC), also referred to as an automated vehicle identification systems (AVIS).

- Areas include: School zones, work zones, near city parks, and corridors on state, US, and interstate highways (CDOT only). Local Agencies may apply through a CDOT Special Use Permit.

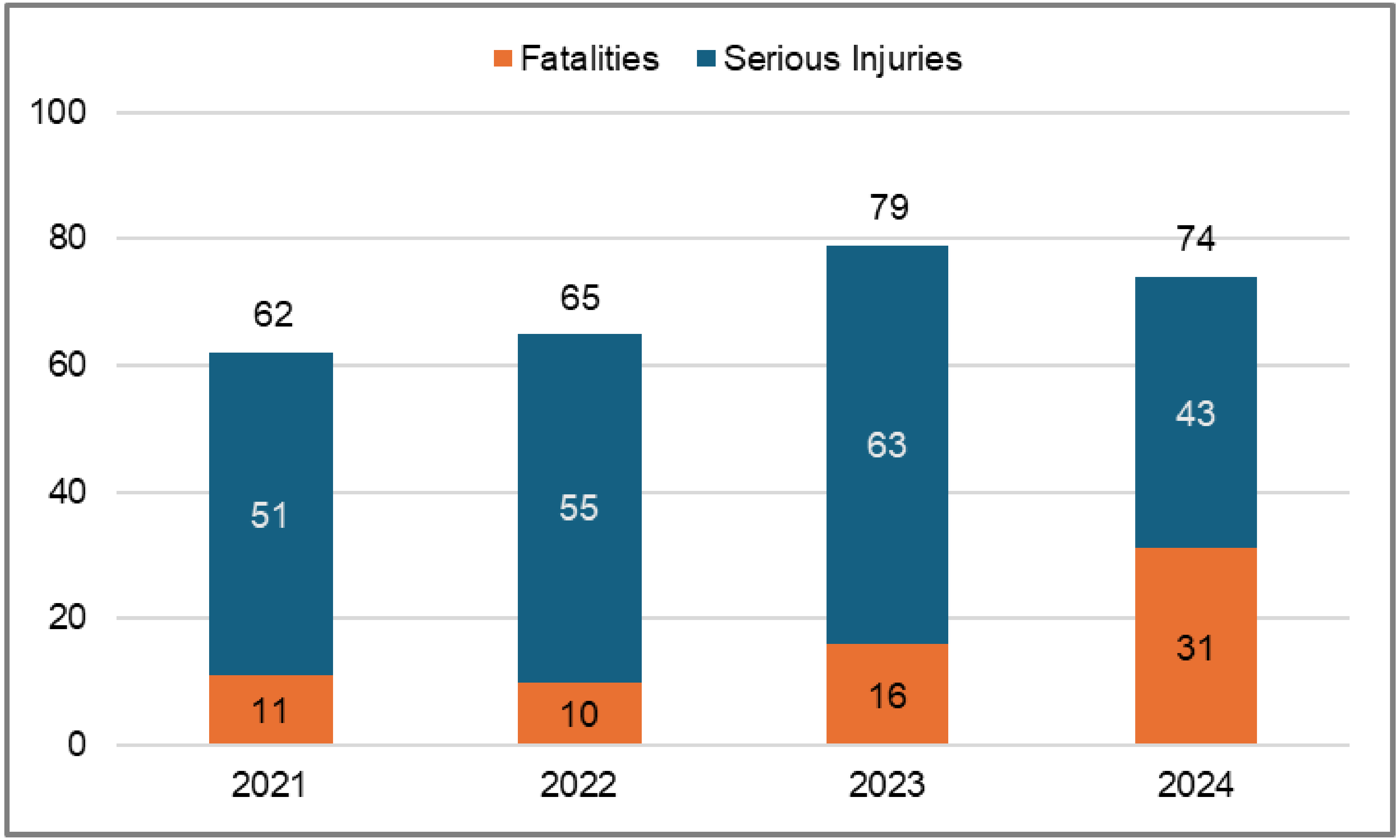
- CDOT is focusing on work zones in March 2025 with one (1) pilot site expanding to up to four (4) within the calendar year.

- Broad public outreach begins in February 2025 with Media Blitz in March 2025 before going live with warnings.

Colorado Statewide Work Zone Related Crashes



Work Zone Related Fatalities and Serious Injuries



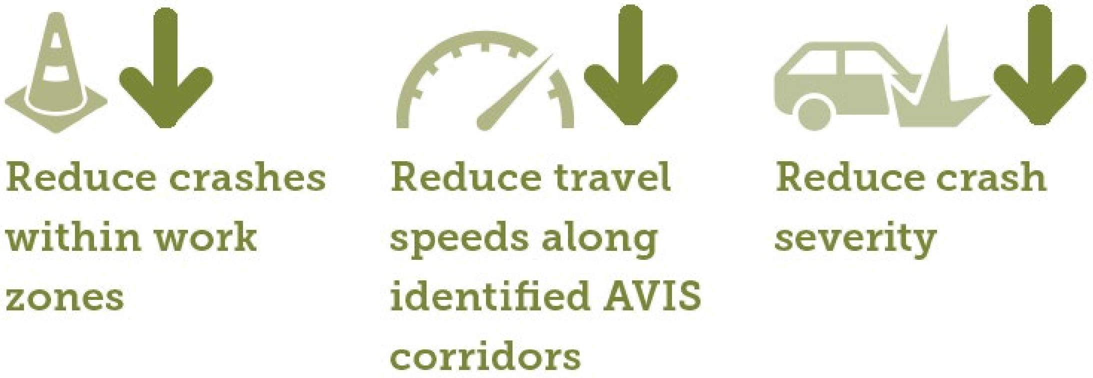
Speed Safety Camera Program and Goals

Objective

The goal of the AVIS Program is to establish an effective corridor program to **reduce speeding** and **increase safety** along CDOT owned highway facilities as noted in the Colorado Revised Statutes 42-4-110.5.

Benefits

Goals



- ➔ **Increase safety for officers** and the traveling public by allowing enforcement at locations that might be too dangerous for traditional traffic stops
- ➔ **Reduce congestion** that may result from traditional traffic stops or from speeding-related crashes
- ➔ **Reduce secondary crashes** associated with congestion caused by traffic stops or speeding-related crashes
- ➔ The program generates a high rate of speeding violation detections and citations, which may provide greater **deterrence of speeding**

Speed Safety Camera Outreach Graphic

Safer Kids
Increase pedestrian safety by reducing speeds near schools and neighborhoods

Protect Their Tomorrow Today

Safer Workers
Fewer speed-related crashes, help create a safer environment for workers

Respect the Vest

SLOW DOWN

SAFETY

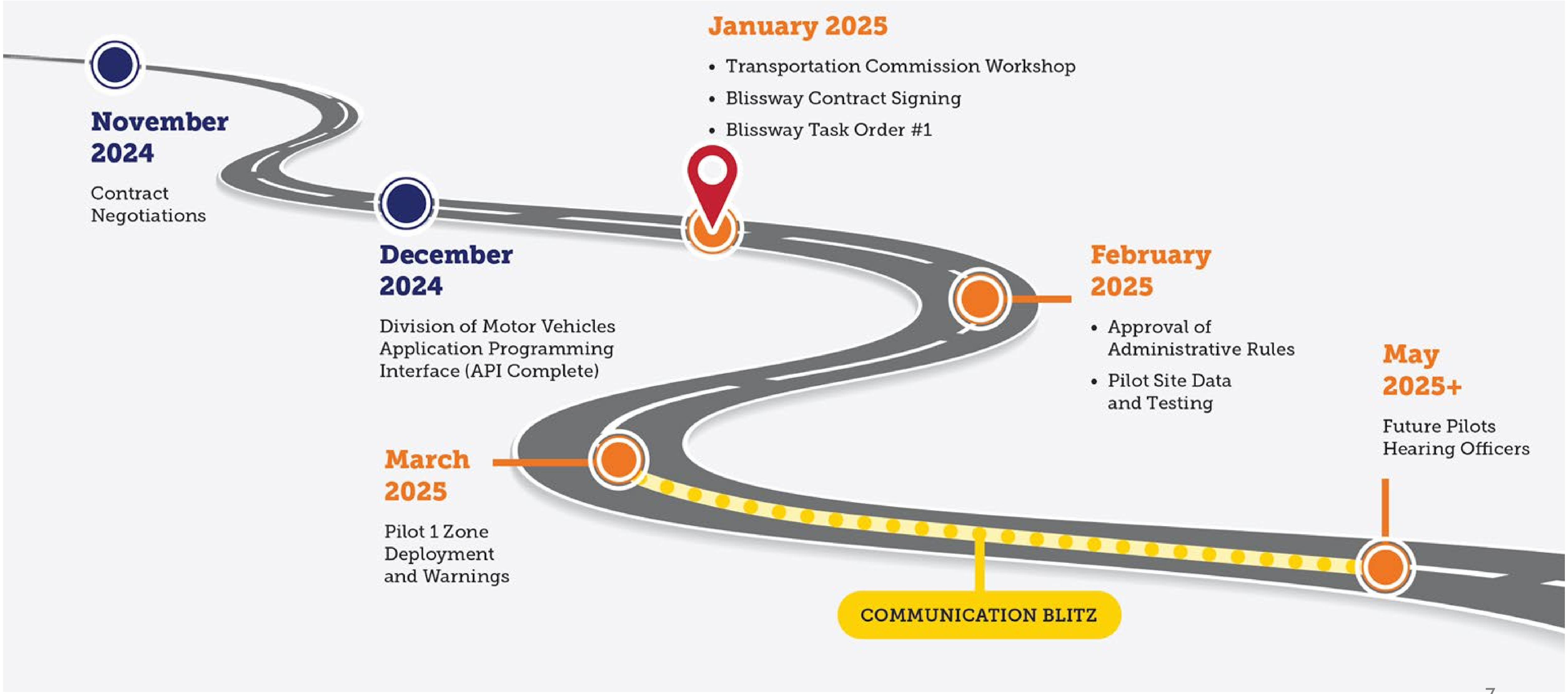
Safer Drivers
Improve safety by increasing speed compliance on CDOT-owned facilities

Speed Less, Care More

Safer Roads
Reducing travel speeds can decrease crash severity

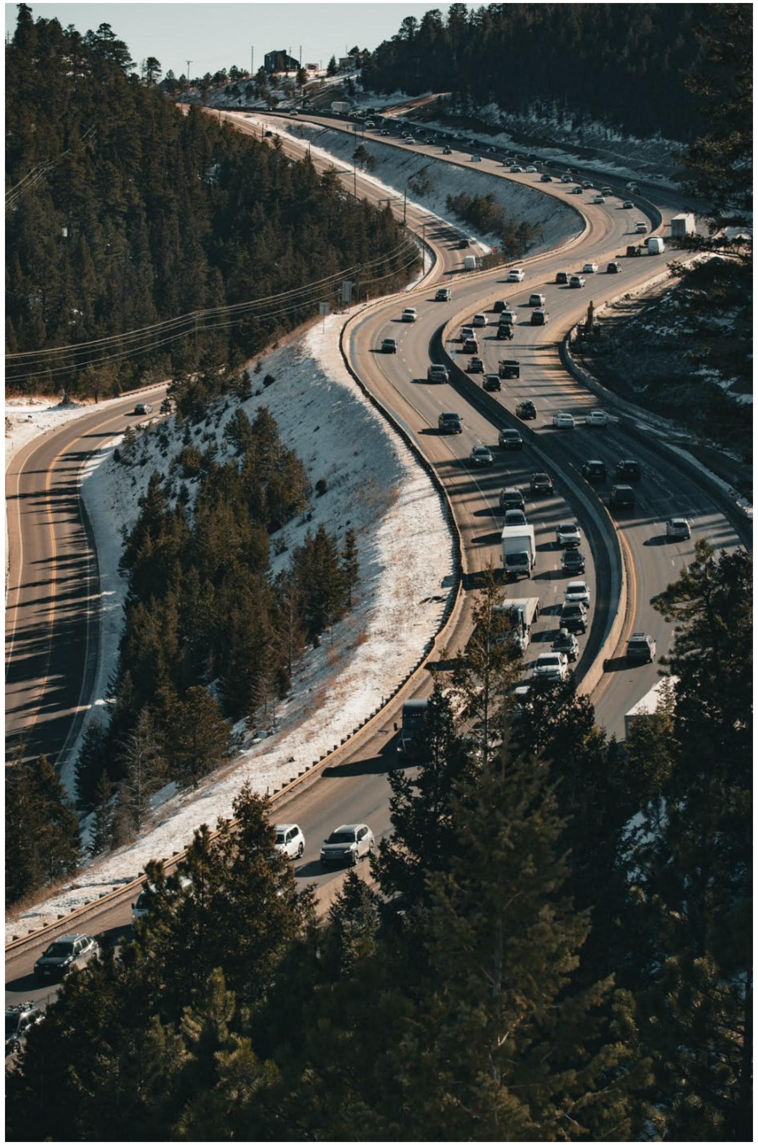
Shared Roads and Responsibility

Schedule and Next Steps



Program Facts

- Administration: CDOT (Local Agencies may apply by permit)
- Back Office: Vendor (Blissway) is issuing warnings, violations, and civil assessments through their system.
- Colorado State Patrol is a partner reviewing Local Agency requests for Speed Safety Cameras.
- CDOT is focusing on work zones first in 2025 with one (1) pilot site expanding to up to four (4) more within the calendar year.
- Pilot year for the program will cost between $2 million and $5 million. Variables include enforcement hours, number of sites, and number of citations.



Questions?

Bridge and Tunnel Enterprise Board of Directors Memorandum

To: The Bridge and Tunnel Enterprise Board of Directors
From: Patrick Holinda, Bridge and Tunnel Enterprise Manager
Katie Carlson, Bridge and Tunnel Enterprise Financial Manager
Date: January 15, 2025

Subject: Bridge and Tunnel Enterprise 10-Year Plan Financing Workshop

Purpose
Staff prepared this workshop to provide the Bridge and Tunnel Enterprise (BTE or the Enterprise) Board of Directors (Board) a briefing on the outcome of the Series 2024B Senior Revenue Refunding Bond (Series 2024B Refunding Bond) transaction and an informational progress update on BTE's contemplated new money financing in early 2025.

Action
No approval action is being requested this month. Staff requests Board feedback on ongoing Enterprise planning activities.

Background
Bridge and Tunnel Enterprise issued the first tranche of its new money Infrastructure Revenue Bonds in the Spring of 2024. This transaction generated approximately $163 million in project funds to support CDOT with the funding and delivery of the 10-Year Plan and the US 50 Blue Mesa Bridges Emergency Response Project. These funds are fully budgeted for BTE's calendar year 2024 construction projects.

Subsequently, in December of 2024, BTE closed on its Series 2024B Refunding Bonds, which refunded the remaining outstanding Series 2010A Build America Bonds. The benefits of this transaction included:

- Reducing BTE's aggregate debt service obligation while correspondingly increasing the Enterprise's pay-as-you-go program through fiscal year 2041.
- Increasing BTE's structuring flexibility and capacity for future new money issuances.
- Eliminating the Build America Bonds subsidy, and reducing programmatic reliance on these funds, which are subject to federal sequestration.

BTE's recent refunding transaction strengthens its financial position in advance of planned new money financings in 2025 and 2026. BTE's Plan of Finance, which includes these planned transactions, will allow the Enterprise to meet its commitments to the CDOT

10-Year Plan, manage its cash flow and fiscal constraint, and deliver all planned projects on their current schedules.

Details

As previously discussed at the BTE financing workshops held in 2023 and 2024, the timing and scale of several key strategic projects created a funding gap for the BTE that was estimated to be in the range of $400 million to $500 million. To address this funding gap, BTE developed a Plan of Finance in consultation with its Board that contemplated issuing debt in three tranches over approximately three years. After updating BTE's financial models to include the parameters of the recent financing transactions and the most recent cost and schedule data available for planned projects, the funding gap is currently estimated to be $233 million, indicating that BTE's current Plan of Finance will provide the capacity necessary to eliminate the funding gap and deliver all planned projects on their current schedules.

BTE is initiating the planning stages for the contemplated 2025 new money financing, the second of the three tranches, which is estimated to be in the range of $200 million to $250 million. The exact size and timing of this transaction will be dictated by the Enterprise's calendar year 2025 construction projects, including I-70 Floyd Hill Construction Package #4. Staff will evaluate structuring alternatives for the contemplated new money financing, monitor market conditions, and return to brief the Board on the recommended structuring alternative for the planned transaction. The need for subsequent financings beyond 2025 will be determined once refined cost estimates and schedules are available for BTE's calendar year 2026 construction projects.

Next Steps

1. Staff will coordinate with OFMB to adjust the FY2025 and FY2026 budgets to reflect the Series 2024B Refunding Bond transaction.
2. Staff will work with the underwriting syndicate, its Municipal Advisor, and Bond Counsel to evaluate and refine structuring alternatives for the planned new money financing in early 2025.
3. Staff will provide a future deep dive workshop recommending a structure for the contemplated 2025 new money financing.

Attachments

Attachment A: BTE 10-Year Plan Financing Workshop

COLORADO
Department of Transportation

Statewide Bridge and Tunnel Enterprise 10-Year Plan Financing Workshop

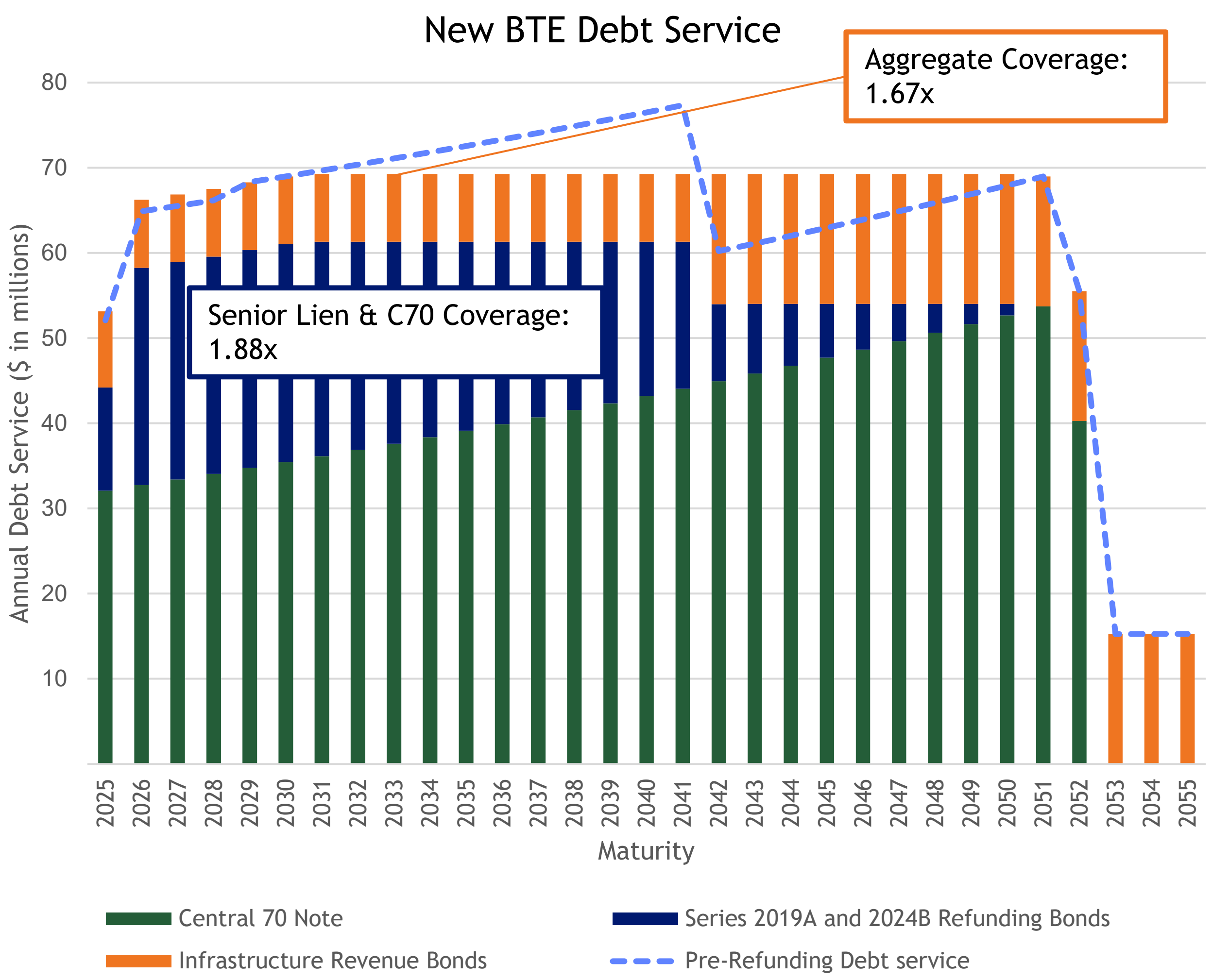
January 2025

Agenda

1. 2024 Refunding Transaction Briefing
2. 2025 New Money Transaction Planning Status
3. Financial Forecast Update
4. Timing and Next Steps

Series 2024B Refunding Transaction

- BTE closed on the Series 2024B Revenue Refunding Bonds on December 19th, 2024
- Bond Proceeds:
  - Par Amount: $236,090,000.00
  - Premium: $35,300,182.30
  - Total Proceeds: $271,390,182.30
- Net present value savings of $1,450,667.19
- Proceeds will be used to defease the outstanding Series 2010A bonds and pay for cost of issuance expenses
- The BTE debt service profile was restructured to provide increased flexibility and capacity for planned financings



Contemplated New Money Financing

- BTE staff are beginning the planning stages for the second of three contemplated financings totaling an estimated $400 million - $500 million in value that will be used to fund BTE eligible scope in the CDOT 10-year Plan
- The estimated size of the financing is forecast to be in the range of $200 million to $250 million
- Issuance size is based on construction funding needs in calendar year 2025
- BTE anticipates that bond proceeds will be used exclusively to fund the CDOT 10-Year Plan
  - Floyd Hill Construction Package 4
- BTE staff will return with a deep dive workshop to present the proposed structuring for this transaction

BTE Financial Forecast

FY24-FY33 Available Revenues vs. Project Commitments by FY ($ in Millions)
Programmatic Baseline - No Additional Bonding

Funding/Expense Source	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	Total
Revenues [1]	$ 170	$ 168	$ 176	$ 186	$ 197	$ 214	$ 218	$ 223	$ 227	$ 231	$ 2,009
2024A Bond Proceeds	**164**										$ 164
Surplus/Deficit from Prior FY [2]	15	17	(161)	(136)	(233)	(213)	(133)	10	158	310	$ (366)
Non-Project Expenses [3]	(51)	(49)	(49)	(49)	(50)	(65)	(65)	(65)	(65)	(66)	$ (574)
10-Year Plan Projects (FY24-FY29) [4]	(172)	(220)	(52)	(204)	(104)	(59)	-	-	-	-	$ (811)
Safety Critical & Asset Management Projects [4]	(109)	(68)	(42)	(21)	(15)	(2)	(2)	(2)	(2)	(2)	$ (265)
2024A Infrastructure Revenue Bonds Debt Service [5]	-	(9)	(8)	(8)	(8)	(8)	(8)	(8)	(8)	(8)	$ (73)
Cumulative Capacity/Deficit	**$ 17**	**$ (161)**	**$ (136)**	**$ (233)**	**$ (213)**	**$ (133)**	**$ 10**	**$ 158**	**$ 310**	**$ 465**	

Source: Various, see below
1 OFMB and pertinent debt service schedules – Reflective of the BABs Bonds Refunding as of December 2024.
2 BTE staff - Amounts reflected are annual estimated year-end roll forwards from the prior fiscal year
3 BTE staff and pertinent debt service schedules
4 Region staff - Based on planning-level project expenditure forecasts. Subject to change.
5 Based on 2024A IRB debt service schedule

Estimated Maximum BTE Deficit

Note: Variances in the funding gap are expected as construction cost estimates, schedules, and expenditure forecasts are refined.

BTE Financial Forecast incl. Future Financing

FY24-FY33 Available Revenues vs. Project Commitments by FY ($ in Millions)
Current Plan of Finance - $450 million Par Value Bonding Scenario

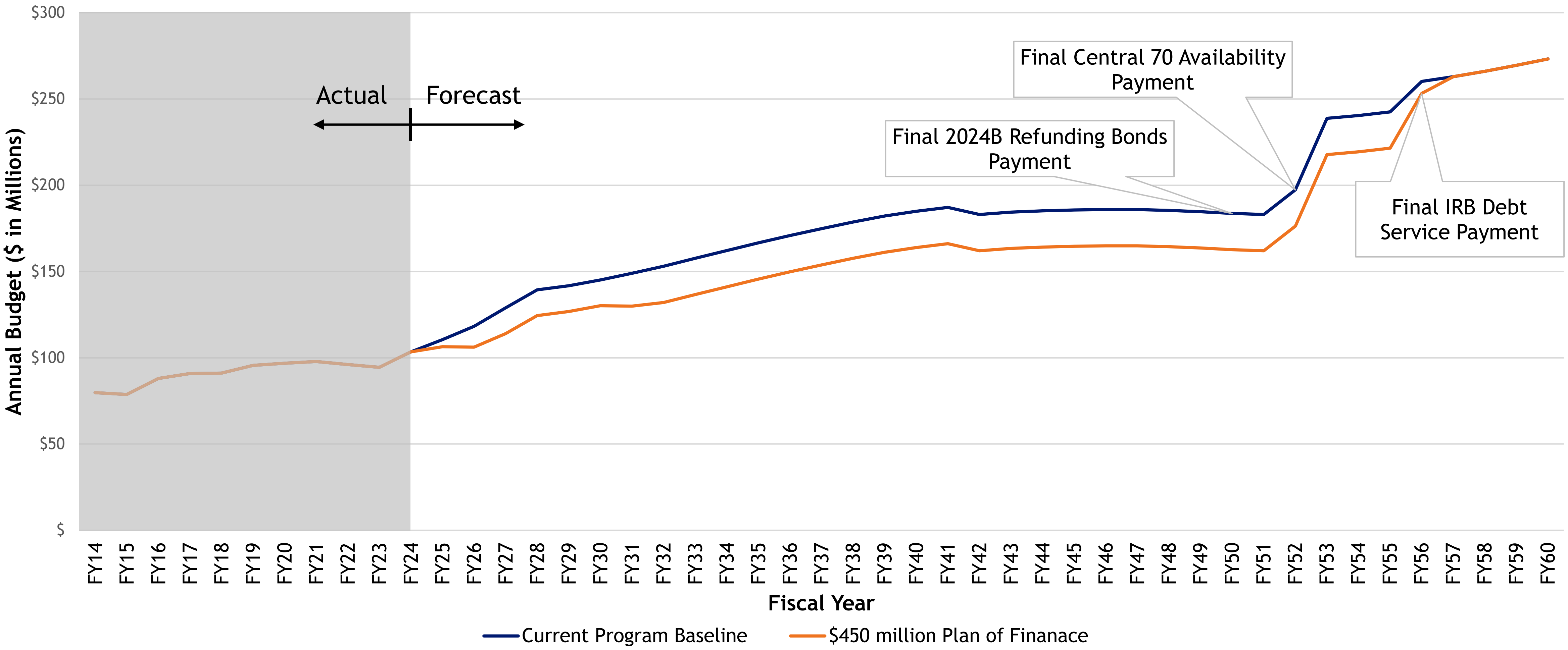
Funding/Expense Source	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	Total
Revenues [1]	$ 170	$ 168	$ 176	$ 186	$ 197	$ 214	$ 218	$ 223	$ 227	$ 231	$ 2,009
Total Planned Bonding Program	**164**	**200**	**100**	**-**	**-**	**-**		**-**	**-**	**-**	**$ 464**
Surplus/Deficit from Prior FY [2]	15	17	35	148	36	41	106	234	363	494	$ 1,489
Non-Project Expenses [3]	(51)	(49)	(49)	(49)	(50)	(65)	(65)	(65)	(65)	(66)	$ (574)
10-Year Plan Projects (FY24-FY29) [4]	(172)	(220)	(52)	(204)	(104)	(59)	-	-	-	-	$ (811)
Safety Critical and Asset Management Projects [4]	(109)	(68)	(42)	(21)	(15)	(2)	(2)	(2)	(2)	(2)	$ (265)
Total Estimated Infrastructure Revenue Bonds Debt Service [5]	**-**	**(13)**	**(20)**	**(23)**	**(23)**	**(23)**	**(23)**	**(27)**	**(29)**	**(29)**	**$ (210)**
Cumulative Capacity/Deficit	**$ 17**	**$ 35**	**$ 148**	**$ 36**	**$ 41**	**$ 106**	**$ 234**	**$ 363**	**$ 494**	**$ 628**	

Forecast Low Point in Funding Resources

FY29-FY33 Avg. Annual Funding Capacity = $117M

Source: Various, see below
1 OFMB and pertinent debt service schedules – Reflective of the BABs Bonds Refunding as of December 2024.
2 BTE staff - Amounts reflected are annual estimated year-end roll forwards from the prior fiscal year
3 BTE staff and pertinent debt service schedules
4 Region staff - Based on planning-level project expenditure forecasts. Subject to change.
5 Based on 2024A IRB debt service schedule and Staff calculated debt service for contemplated issuances

Pay-go Program Forecast



Prospective Transaction Timing

January	February	March	April	May
• BTE analyzes structuring options for contemplated financing	• **BTE to present proposed financing structure to the Board**	• **BTE Board presented the approving resolution for financing** • **BTE Board presented a budget supplement to allocate financing proceeds to CY2025 projects**	• BTE coordinates with OFMB to reconcile the FY2025 budget to account for changes from the recent financing transactions	• Construction expenditures forecast to begin for CY2025 projects

Board items are represented in Bold

COLORADO
Department of Transportation

Questions or comments?

Transportation Commission Memorandum

To: Transportation Commission
From: Bob Fifer, Deputy Director of Operations
Heather Paddock, Region 4 Transportation Director
Date: January 15, 2025

Subject: National Renewable Solutions (NRS) Request for Approval - Public Private Initiative (PPI) Agreement (New Longitudinal Overhead Transmission Lines in CDOT ROW)

Purpose

This memorandum summarizes an unsolicited proposal for a unique public-private partnership, its background, and the proposed next steps.

Action

Issue Resolution providing express approval of the proposed PPI Agreement pursuant to Section 3.2.2.6 of the Utility Accommodation Code.

Background

In October 2022, National Renewable Solutions (NRS) submitted to CDOT an Unsolicited Proposal (§§ 43-1-1201, C.R.S.) to build a longitudinal high voltage transmission line on the I-76 corridor right of way from mile point 99.2 to mile point 151.8. In exchange for this use of CDOT right of way (ROW), NRS will provide CDOT fiber instruction along the corridor and power infrastructure.

Over the last two years, staff has worked with NRS to better understand how the unique proposal could be accommodated in CDOT's ROW.

By October 2023, NRS had returned the State's Master Task Order Agreement with proposed revisions and comments.

From December 2023 through June 2024, CDOT staff and internal subject matter experts worked closely with partners at FHWA and Wisconsin DOT to evaluate and review the agreement's terms and conditions, which required a deeper technical understanding of the proposal to install longitudinal high voltage transmission lines above ground.

In August 2024, NRS shared preliminary plan sets.

From September 2024 through November 2024, CDOT hosted technical review meetings with NRS, CDOT, and FHWA to better understand and inform the potential partnership.

In December 2024, the Federal Highway Administration (FHWA) scheduled a site visit of the I-76 corridor with CDOT. Following the site visit, FHWA provided conditional approval via email, stating their concurrence with CDOT to move forward with a master task order agreement and to continue working with NRS on the initial stages of preliminary engineering. FHWA expects that any detailed contingencies will be identified during preliminary engineering.

Next Steps

Due to the unique circumstances and the following conditions:

- "First of its kind" of an unsolicited proposal through the PPI process that CDOT has received for high voltage above-ground transmission lines in CDOT ROW.
- FHWA's broadened guidance is for alternative uses of ROW.
- The Governor's initiatives related to renewable energy.
- CDOT anticipates a bill related to longitudinal high voltage transmission lines utilizing state ROW will be proposed in the next legislative session.

The program area is seeking concurrence from the Transportation Commission to move forward with this partnership by following these steps:

1. CDOT staff has proposed adding two preliminary steps to typical processes for PPIs for this Unsolicited Proposal prior to proceeding, including:
    a. Gaining approval from FHWA for the alternative use of Interstate ROW and
    b. Receive the Chief Engineer's determination that special extenuating circumstances exist for the proposed project as required by the Utility Accommodation Code.
2. Seeking the Transportation Commission's express approval to finalize and execute the PPI agreement.

After gaining these approvals, CDOT staff would follow the typical process for a PPI agreement, including:

3. Executing a Master Task Order Agreement that outlines roles and responsibilities and the concept of the unsolicited proposal.
4. Executing subsequent Task Orders that specify project areas and specific infrastructure exchanges for specific locations.
5. The Partner must apply for and obtain applicable Region permits to perform and implement the work agreed upon in each Task Order.

Attachments

National Renewable Solutions Unsolicited Proposal

2 C.C.R. 601-18 (Rules and Regulations of the Colorado Department of Transportation Pertaining to Accommodating Utilities in the State Highway Rights of Way)

COLORADO
Department of Transportation

National Renewable Solutions (NRS) Request for Approval Public Private Initiative Agreement

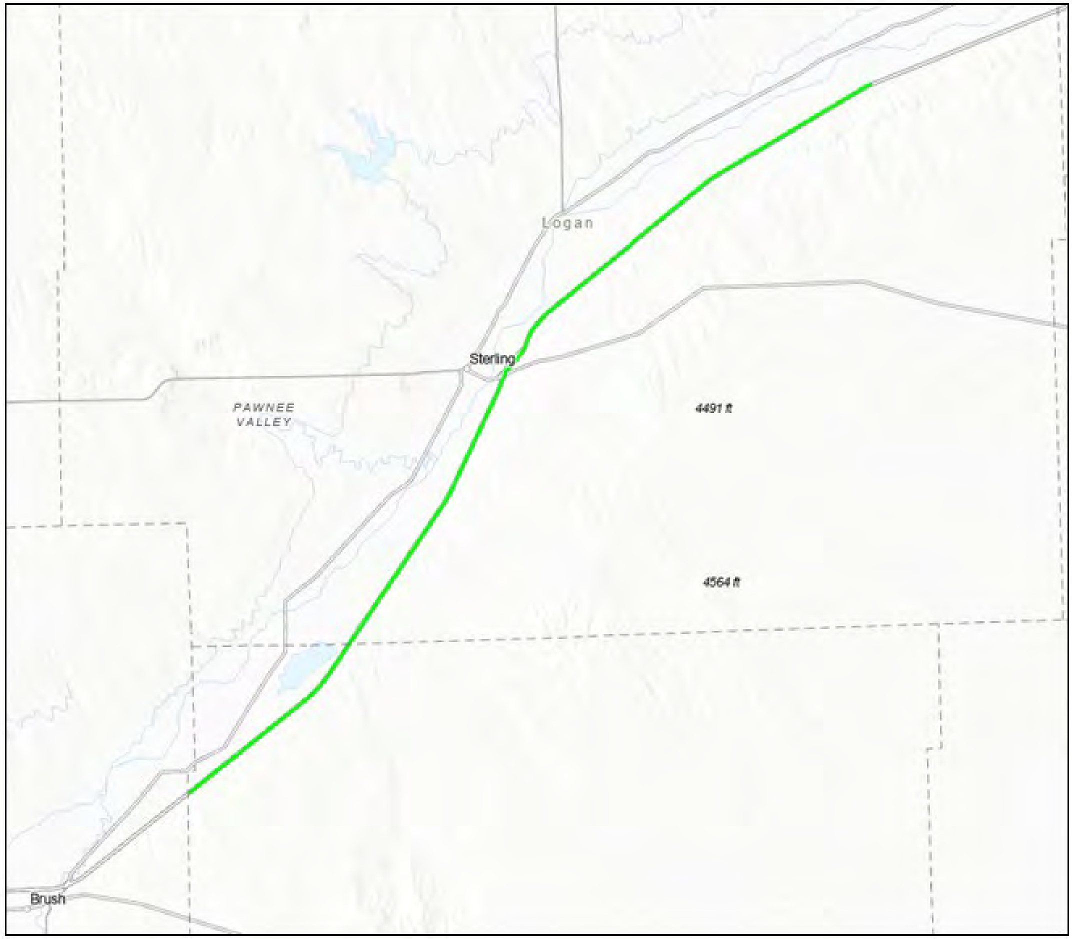
(New Longitudinal Overhead Transmission Lines in CDOT ROW)

January 15, 2025

Overview

Unsolicited Proposal through the Public Private Initiatives (PPI) Program (§§ 43-1-1201, C.R.S.):

- National Renewable Solutions (NRS) proposes to build a High Voltage Transmission line along the I-76 corridor right of way from mile point 99.2 to mile point 151.8.
- NRS proposes to compensate CDOT for the use of the ROW by installing fiber and power infrastructure along the route.



Background

Timeline:

- October 2022 - CDOT Received Unsolicited Proposal from NRS.
- October 2023 - NRS provided redlines on CDOT's template master task order agreement.
- December 2023 through June 2024 - CDOT continued working through redlines and requesting more details from NRS about the proposed project.
- August 2024 - NRS shared preliminary plan sets.
- September 2024 through November 2024 - CDOT hosted technical review meetings with NRS, CDOT and FHWA to better understand and inform potential partnership.
- December 2024 - Federal Highway Administration (FHWA) scheduled a site-visit of the I-76 corridor with CDOT.
- Following the site-visit FHWA provided conditional approval:
    - FHWA emailed their concurrence to CDOT to move forward with a master task order agreement and to continue working with NRS on the initial stages of preliminary engineer. FHWA expects that any detailed contingencies will be identified during preliminary engineering.

Stakeholders

Internal CDOT Stakeholders:

- Leslie Gaylord, ITS Fiber Product Manager
- Rob Martindale, Utilities Engineering Program Manager
- Timothy Bilobran, Region 4 Permit Manager
- Katrina Kloberdanz, Region 4 Traffic Engineer
- Jill Scott, ITS Resident Engineer
- Anna Ruga, ITS Electrical Engineer
- Vanessa Santistevan, Region 4 Environmental Protection Specialist
- Eric Vigil, ITS Maintenance Manager
- David Fox, CDOT Real Estate Department
- Randall Dingle, CDOT Contract Administration
- Mike King, CDOT Innovative Mobility
- Emily Haddaway, CDOT Government Relations

External Stakeholders:

- Justin Curry, Attorney General's Office
- Andrew Wilson, FHWA
- Shaun Cutting, FHWA
- Julie Johnston, FHWA
- Eva LaDow, FHWA
- Stephanie Gibson, FHWA
- Dan Schultz, Wisconsin DOT Maintenance Engineer
- Kathy Jennings, Wisconsin DOT Maintenance Engineer
- Bob Fasick, Wisconsin DOT Statewide ROW Permit Engineer

Process and Next Steps

If the proposed project design stays above ground as requested by NRS:

1. NRS and CDOT to work directly with FHWA for preliminary approval, then
2. Receive the Chief Engineer's determination that special extenuating circumstances exist for the proposed project as required by the Utility Accommodation Code, then
3. CDOT EMT to present to Transportation Commission seeking express approval to finalize and execute the PPI agreement,

Then, follow the typical Public-Private Initiate Agreement process:

3. Program area to work with NRS to finalize and execute a Master Task Order Agreement, then
4. Program Area to work with NRS to execute Task Order(s), then
5. NRS can apply for CDOT Region permits.

Why Transportation Commission Consideration?

- Section 3.2.2.5 of CDOT's Utility Accommodation Code currently prohibits new longitudinal utility installations unless (i) CDOT determines special extenuating circumstances exist for new longitudinal utility installations; and (ii) if CDOT makes such determination, the new longitudinal utility installation must meet additional conditions (*e.g.* underground installation, installation along the outer edge of the ROW in a utility strip established by CDOT, and no installations in the median).
- NRS' proposed project contemplated under the PPI agreement includes construction of new, overhead transmission lines located in interstate ROW. As a result, CDOT (through the Chief Engineer) must first determine special extenuating circumstances exist for NRS to meet the exception to the general prohibition of new longitudinal installations. Additionally, because NRS proposes overhead (not underground) installation, CDOT will need to grant a variance to the Utility Accommodation Code as part of the permitting phase of the project.
- Next, because the subject project is a PPI project, Section 3.2.2.6 of CDOT's Utility Accommodation Code also requires express approval of the Transportation Commission and FHWA.
- CDOT has already received approval of the subject project from FHWA. CDOT now needs express approval from the Transportation Commission regarding the proposed PPI Agreement pursuant to Section 3.2.2.6 of the Utility Accommodation Code and the unique nature of this proposed PPI Agreement.

Political Context

High Voltage Transmission Lines:

- In September 2024, Next Gen Highways and the Colorado Electric Transmission Authority (CETA) hosted a meeting at the Colorado Energy Office to introduce this topic to a broader set of potential stakeholders and identify next steps.
- Earlier this year, Minnesota passed a law that would allow the use of highway rights-of-way for siting new transmission lines, which was previously prohibited in that state. Wisconsin has had a similar law in place since the early 2000's.
- Recently folks in various state agencies (Governor's Office, Public Utilities Commission, and Colorado Energy Office) have been informed that the proponents of this policy are looking at Colorado as a potential future focus area.
- It is not clear at this time what legislation might be proposed in Colorado, or when, but based on some high-level conversations with the folks at Next Gen Highways and some materials they have presented elsewhere it sounds like it might include some of the following elements:
    - Language to explicitly allow for or encourage the use of highway ROW for siting new transmission lines
    - Development of a prioritization methodology for new transmission lines that prioritizes existing transmission pathways, then highways, then railways, then private lands (as is the case in WI)
    - Some form of community benefit requirement to compensate impacted towns and counties if and when new transmission lines are constructed

Next Steps

Presentation by NRS

Return to Transportation Commission in February seeking the Transportation Commission's express approval to finalize and execute the PPI agreement

PAWNEE EXPRESS, LLC

Variance Request
Underground vs Overhead

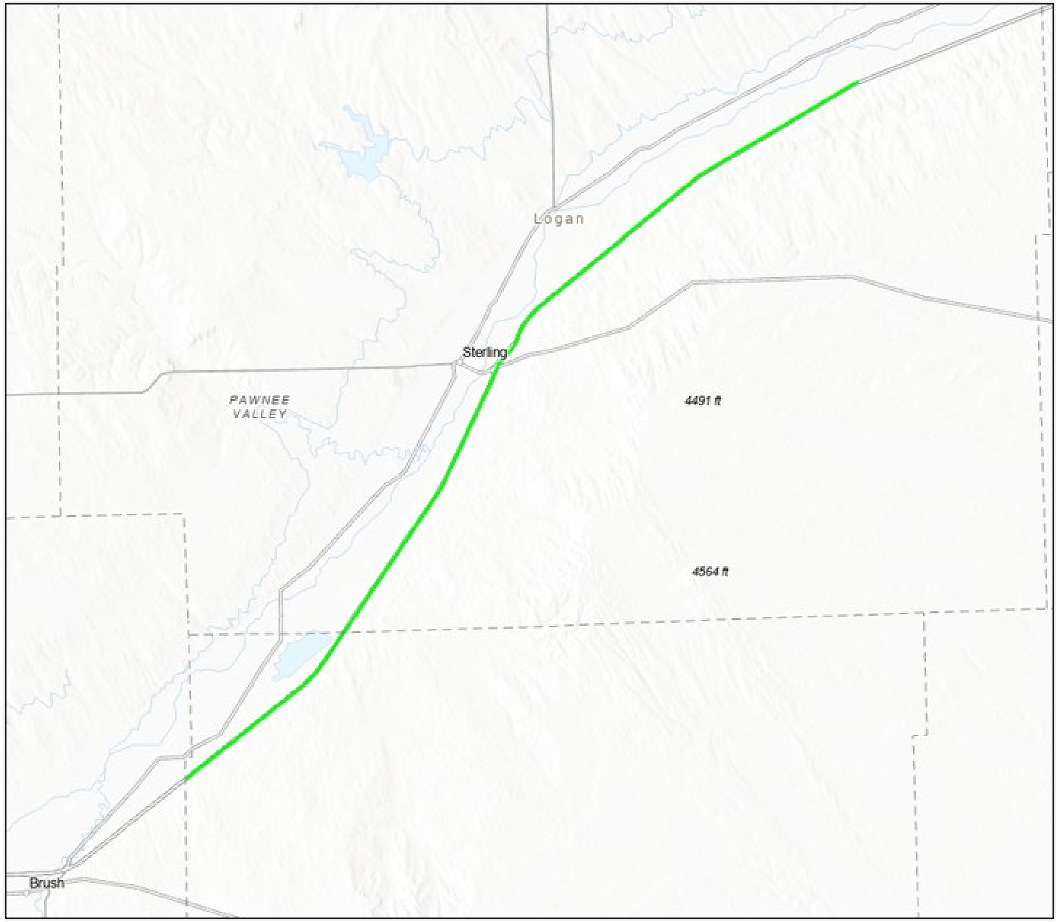
96-mile 345kV AC Transmission Line

January 2025

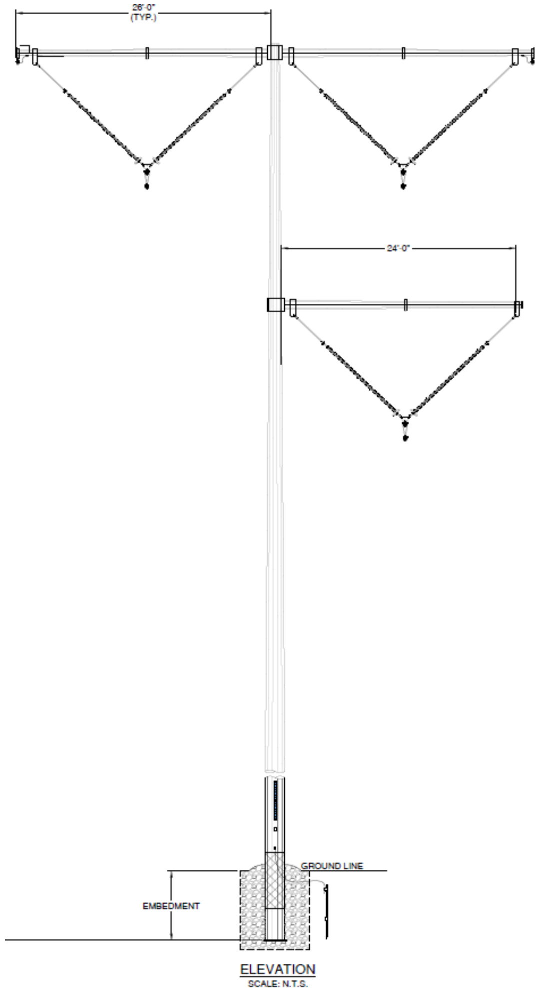
National
Renewable
Solutions

Request for Variance: Overhead Utility in Interstate Corridor

- NRS has proposed a Public Private Initiative to provide CDOT with use of fiberoptic cable in exchange for access to I-76 ROW for the construction and operation of electrical transmission project.
- Overhead high voltage transmission lines are industry standard due to significant advantages compared to underground lines :
  - Approx. 10x higher cost of burying lines is not commercially viable for project or electric customers
  - Buried lines more disruptive to highway operations during construction and maintenance
- Fiber cable provided for CDOT use may be buried underground, co-located with the overhead high voltage transmission line.
- Public Private Initiative would provide significant privately sourced financing for construction of fiber infrastructure for the public benefit.



Variance: Construction Impact

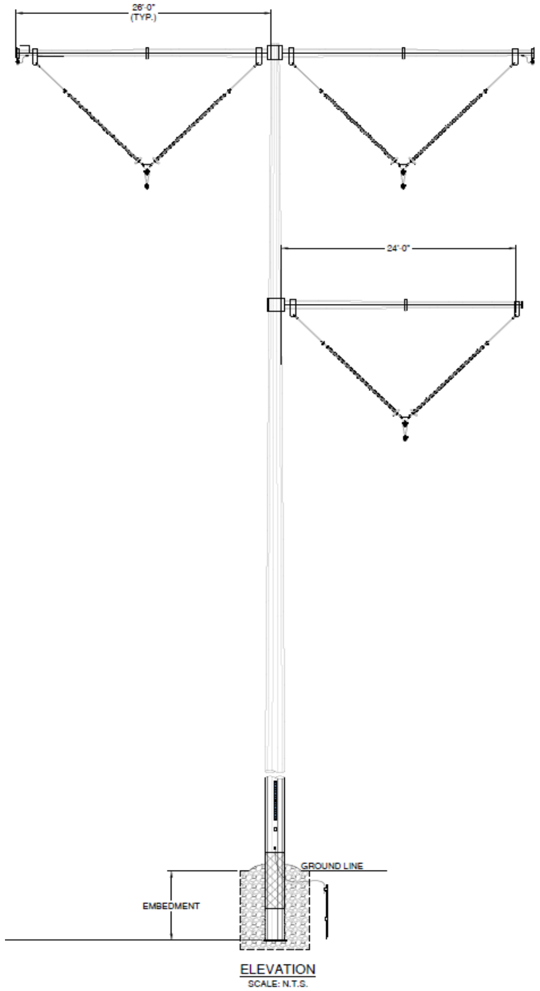


	Aerial Transmission	Underground Transmission
Schedule Impact	Construction duration is expected to be 18 months	Construction expected to be 3 - 4 years minimum
Co-location	Option to co-locate with other utilities	Option to co-locate other "underground" utilities is unlikely with this footprint

Overhead: Typical Pole Foundations 5 - 10 ft diameter, spaced every 700 - 850 feet

Example Underground Duct Bank Triple Trench. Total Width 40-50 feet, continuous over the entire length of the right of way

Variance: Surface VS Aerial Considerations



	Aerial Transmission	Underground Transmission
Right-of–way	• Ground ROW is 20' during the Term • Aerial width 75-80' during the Term	• 50' in perpetuity • Manholes required every 2000 feet, spacing for duct banks (8-9 ft wide)
Environmental	• Considerably less environmental disturbance, and ability to span sensitive areas. Flexibility in mitigation strategies.	• Significant environmental disturbance: Construction will disturb the land throughout the entire 96-mile length, for the 50' width of the line.

Overhead: Typical Pole Foundations 5 - 10 ft diameter, spaced every 700 - 850 feet

Maintenance Response: Pawnee Express Project

Aerial Maintenace Considerations

- Greater reliability and longer design-life.
- Routine inspections can be often performed with remote sensing (aerial / drones).
- Rapid deployment of readily available components.
- Crews can respond to repairs, damages and emergencies within 24-48 hours.

Underground Maintenance Considerations

- Extended repair schedules to isolate the issue and repair underground.
- Access points of ROW, construction, safety impact vary depending on what damage and investigations find.
- Larger, more complicated cables are difficult to repair.
- Routine inspections are more complicated and take longer.
- Long lead times for equipment and components for repairs are not as easily accessible.

National Renewable Solutions: Pawnee Express Project

- **Need for Electric Transmission** .
  - Great need for transmission capacity with increases in Colorado electricity demand driven by rapid electrification, data center development, and new sectors.
  - Rich natural resources in Northeast Colorado are not currently connected to high voltage electrical grid.
- **Efficient Co -location.**
  - Co-locating transmission with highway right of way allows efficient infrastructure sharing, such as fiber cable available for CDOT's Intelligent Transportation Systems.
- **Overhead High Voltage Line is Industry Standard**
  - Overhead high voltage follows established safety plans specifically developed off the industry, state and local jurisdictions.
  - Maintenance of overhead lines is more straightforward and easier to determine.
- **National Renewable Solutions – committed to communities and clean energy**
  - Founded in 2011, NRS is an experienced developer of renewable energy projects.
  - Landowners and local communities are the foundation of every NRS project.
  - Engaged experienced industry partners with experience in engineering, constructing, and maintaining transmission lines in highway corridors.

Unsolicited Proposal

Submitted: CDOT ITS Branch
Colorado Department of Transportation
425C Corporate Circle
Golden, CO 80401

Proposing Entity	Authorized Person
Name: Pawnee Express LLC. Address: 11100 Wayzata BLVD Suite 450, Minnetonka, MN 55305 Main Phone : 952 473-7500 State of Colorado Business ID #: 20221327151	Name: Jesse Hopkins-Hoel Title: Chief Development Officer Address: 11100 Wayzata BLVD Suite 450, Minnetonka, MN 55305 Phone:952 473-7500 Email: jhopkinshoel@natrs.com Signature:

Purpose for Unsolicited Bid:

National Renewable Solutions, LLC (NRS) is a developer of utility scale solar, wind and energy storage projects. NRS is developing solar and wind renewable energy generating projects in Sedgewick, Logan, and Phillips Counties in NE Colorado. In advance of an application for a utility access permit, we are writing to request assistance from the Colorado Department of Transportation (CDOT) to use of ROW along Interstate Highway 76 for the construction of an electrical energy transmission line known as **Pawnee Express**, which would bring reliable renewable electricity to residents of the State of Colorado and would improve resiliency and reliability of the Public Service of Colorado (PSCo) and/or Tri-State Generation and Transmission (TSGT) electrical grid.

NRS is currently conducting design and site control phases for a 345kV transmission line that runs parallel to and within the I-76 ROW starting in Ft. Morgan and running to the NE into Sedgewick County. A 3rd Phase of the Pawnee Express project could extend the transmission line to a terminus at the Nebraska / Colorado border.

The time, expense, and regulatory complexity associated with building transmission infrastructure creates a major impediment to constructing renewable energy projects, particularly in areas without suitable existing infrastructure. **NRS wishes to use all tools necessary to optimize timing and streamline the process to meet Colorado's immediate renewable goals.** If approved, together, we can capitalize on this partnership and benefit in new and exciting ways.

As part of our proposed design, NRS would facilitate additional carrying capacity for fiber broadband for joint-use design alternatives. Optical Ground Wire (OPGW) installation on transmission poles in CDOT

ROW allows for continuous fiber for CDOT operations between the City of Brush and as far north as the Nebraska border along I-76. NRS has also designed the Pawnee Express transmission line with highway safety as a top priority. In particular, the line has been designed to:

1. Limit impact to traveling public by locating transmission poles further from the roadway and on elevated portions of the corridor.
2. Design foundations and dead-end structures to prevent downed line, with guard rail systems to be designed around critical poles.
3. 3. Ensuring clear zone avoidance for transmission wire sag and sway, with a minimum clearance of 30 feet

I Project Characteristics

A. **Description of the proposed project including purpose, state highway location, beginning and ending points.** The Pawnee Express 345kv transmission line (Figure 1) will connect several wind and solar projects in Sedgewick County into the I-76 Corridor at approximately 2.8 miles NE of Highway 55 (Figure 2). The line will move off the CDOT utility corridor near the City of Brush about 4.5 miles to the NE and head south into either the Pawnee or Story Substations (Figure 3). NRS is also evaluating a continuation of the transmission line to the Nebraska border. This proposal requests rights to the I76 corridor to the Nebraska border as part of a 2nd phase of project development, which would permit NRS to extend the project beyond the preliminary route.

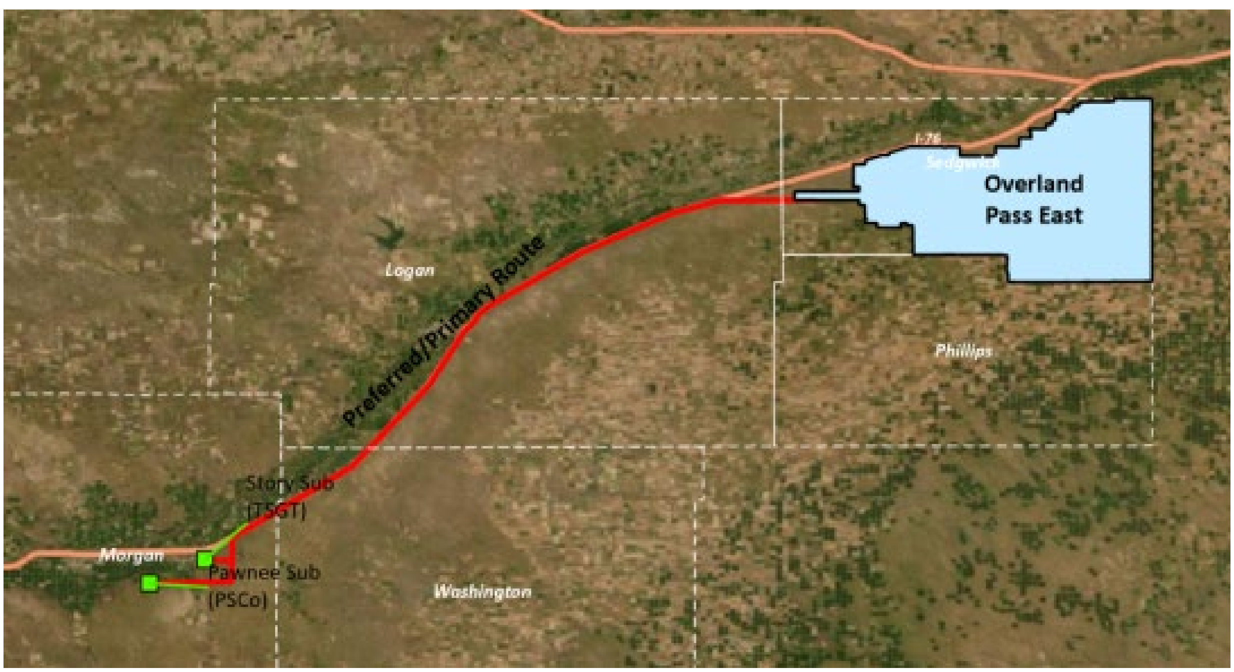


Figure 1

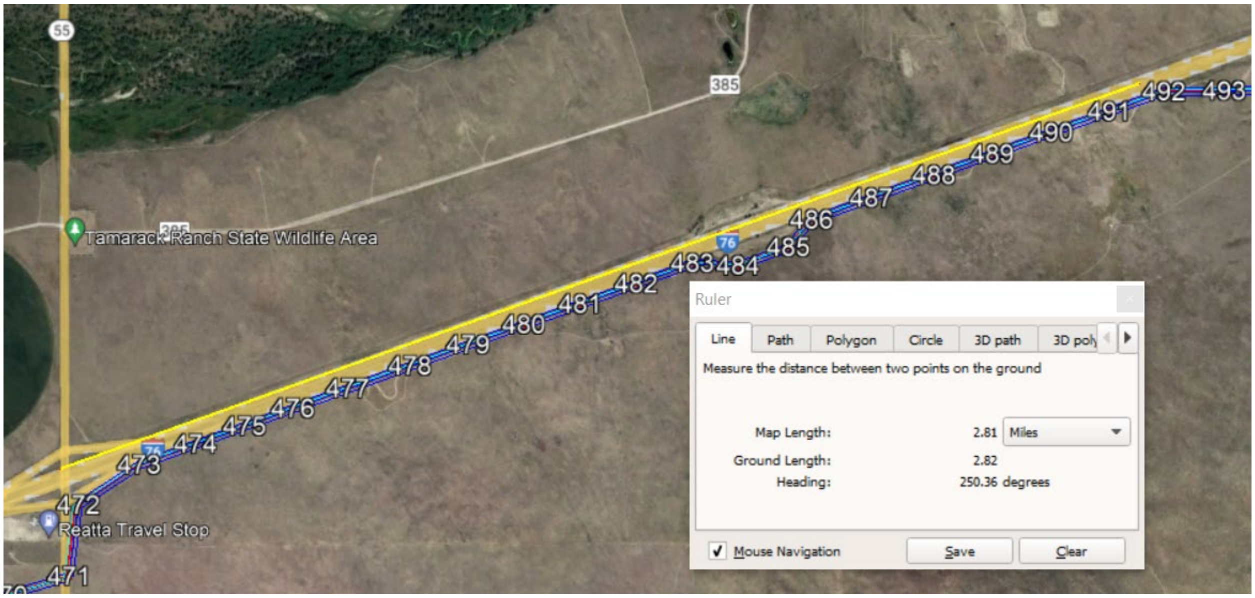


Figure 2 – North point of entry of the Transmission Line from renewable energy projects into CDOT corridor

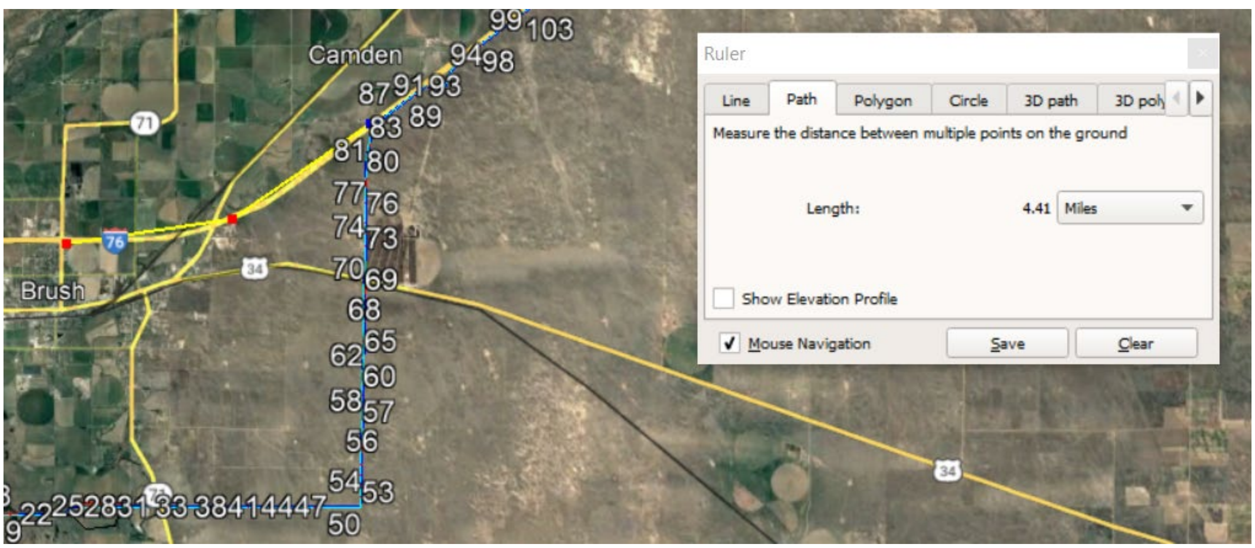


Figure 3 – south portion of the transmission line exiting CDOT corridor

B. **Construction to be performed includes:** 1) Soil boring to determine final pole location, 2) foundation and hole drilling, 3) installation of a 345kv single or double circuit power line on approx. 413 steel monopole structures, 4) up to two Optical Ground Wire Fibers to support both the transmission line infrastructure and CDOT requirements, and 5) multiple fiber pull box locations (Depending on CDOT Requirements).

C. **Access to existing CDOT fiber optic conduit and/or fiber optic cable including specific locations.** CDOT does not have existing fiber in this corridor. No access is required of future CDOT fiber optic conduit and/or fiber optic cable at any current location. We are proposing additional fiber optic cable installation.

D. **Proposed Schedule.** Currently, the Pawnee Express team is acquiring private easements to the north and south of the requested I76 corridor and, in some areas, private "blowout" easements from landowners along the CDOT corridor. Anticipated completion for site control efforts is March 2023. Simultaneously, our engineering firm is working on the route and design with an anticipated design completion of May of 2023. Construction for drilling and anchor bolt cage installation could occur as early as January of 2024, with pole and conductor and fiber installation immediately following. Projected Commercial Operation Date (COD) of the Pawnee Express is Q3 to Q4 of 2025 to support anticipated electricity demand from Public Service of Colorado (PSCo) and/or Tri-State Generation & Transmission (TSGT). Pawnee Express is intended to be a long-term and stable addition to our electrical grid system. Accordingly, we request use of CDOT right of way for the life of the transmission project.

E. **Identify critical factors to ensure the project's success.** The Pawnee Express team identified several critical factors needed to ensure the project's success:

1. Provide for safe and non-impactful travel for the roadway users.
2. Poles that parallel the highway need extra consideration to avoid a vehicle strike.
3. Transmission lines will conform to IEEE recommended best practice to allow for a maximum "sag and sway" and still provide 5-feet additional clearance from the "clear zone" of the highway.

The poles are generally placed at the maximum distance from the edge of road right of way. The attached PLS CAD model has approximate distances of 125 feet from the eastbound center line and approximately 5 feet inside the boundary of CDOT ROW and private land to the east of I-76. Moreover, poles with spans of 600-900 feet are strategically placed on elevated portions of the corridor further providing a natural buffer between the structure and motorist.

In the case of a catastrophic event, the design includes foundations and dead-end structures that facilitate the stoppage of any "domino effect" downed line. Currently, there is not a design option for transmission lines to have a "break-away" structure like street lighting. As an alternative, the NRS team would design and emplace guard rail systems along critical poles in consultation with CDOT Engineering.

The design has ACSR bundled conductor showing a minimum above ground clearance IAW NESC code + safety factor. This results in a minimum ground clearance of 30 feet at max sag. In addition, locating transmission poles approx. five feet from the edge of ROW allows for the maximum distance from "clear zones."

F. **Identify any anticipated adverse social, economic and environmental impacts, and strategies or actions to mitigate the anticipated impacts.** This CDOT transmission route proposal has been submitted in order, specifically, to (a) mitigate impacts to rural farm and ranch lands, (b) largely mitigate collision and safety risks within the CDOT ROW, (c) provide positive economic impacts to communities within the generation project area and along the transmission path, alike. As the proposed Pawnee Express transmission line specifically supports 4-5 significant wind, solar and storage projects (totaling between 600-1000 MW), the overall economic impact is in excess of $700 million dollars with portions of the revenues shared with local landowners who participate in the project, generate local tax revenue and create jobs during construction and for ongoing operation and maintenance of the project. Aside from the inclusion of fiber for CDOT within this proposal, the overall impact of the transmission will occur during the construction phase is estimated to be between $50-$80 million for local material (ie, steel rebar, cement, rock, matting, etc), local professional services (such as, survey, engineering, drill operators, line crews, laborer to support installation), and related local community services (such as lodging, gas, food).

G. **Identify unique and innovative methods, techniques and/or approaches that may be employed on the project.** Among the innovative and unique methods and techniques employed in design and construction of this project, we have highlighted three aspects for consideration:

1. The sharing of overhead fiber with existing transmission structure allows for a more efficient use of land and reduced impact to the surrounding area. By utilizing the existing utility corridors, the environmental impact is mitigated because this land has been cut and cleared and is suitable for utility purposes.
2. The Pawnee Express line plan includes a second phase to extend the line and its capability to enhance the grid. Phase 2 would extend the transmission line by approximately another 20 miles within Colorado to the Nebraska border, connecting PSCO's system with the Southwest Power Pool. This second phase would provide up to 2 GW of transfer capability between the SPP system and the WECC system, providing additional grid stability and expanding the reach of renewable resources from Colorado and other areas in the Southwest United States to serve load centers in the Eastern Interconnect. This approach would further leverage the transmission benefits of PSCo's Colorado Power Pathway plan and extend the benefits of enhanced electrical transmission and fiberoptic cable systems to underserved areas in far Northeastern Colorado.
3. Currently, Pawnee Express is reviewing the potential of the Bold Transmission Pole or mono-pole designs to facilitate a smaller footprint in lieu of traditional H-Frame or Lattice Tower construction. Innovative pole designs allow for increased power delivery capacity while minimizing structure heights reducing the right of way needed for the same (or greater) amount of electricity transmitted (75 feet on each side at 345kv line).

II. Qualifications, Capabilities and Experience

A. Description of proposer's qualifications and capabilities to ensure successful completion of the proposed project. National Renewable Solutions, LLC ("NRS") is a renewable energy company founded in 2011 and based in Minnetonka, Minnesota. NRS originates, acquires, and develops renewable energy projects throughout the US at various stages, including from greenfield through operations. Our history represents a wind and solar portfolio of over 1 GW of either operating or NTP-ready projects, demonstrating a strong track record in a competitive field. Our current active development portfolio comprises over 4 GW of renewable projects. For further information, please visit our website at: [About - National Renewable Solutions (natrs.com)]

B. Identify related experience with similar projects that proposer successfully implemented, including experience in working and/or partnering with the public sector. National Renewable Solutions, the parent company to Pawnee Express, successfully designed, engineered, and permitted a 345kv Transmission line entirely in Kansas Department of Transportation utility corridor along US Highway 77 in Marion and Butler County, Kansas. With a letter of committal, we moved forward on pole-by-pole approval with the KDOT engineers for "clear zones", line of sight, and traffic safety hazards. This 25-mile line is currently under construction with Orsted as the primary contractor.

C. Describe project management techniques that are integral factors and how they will be applied for achieving successful implementation of the proposed project. All NRS projects are submitted for bid with weighted criteria that includes completion schedule, safety, and performance incentives when particular KPIs are achieved. We understand a critical factor during the construction process is traffic management and ensuring safe passage for both our crews and the traveling public. Through project sequencing, construction crews work daily with CDOT safety coordinator to meet these goals.

I. Public Benefits

A. **Identify potential contribution of the proposed project to the department's mission and how the proposed project will benefit the overall transportation system**. NRS will include the installation of fiber optic cable along the utility corridor. Installation of 60 to 80 miles of fiber along an interstate highway for dedicated CDOT use enables expansion of Intelligent Transportation Systems (ITS). Robust dedicated fiber allows secure continuous network connectivity for dynamic message signs, roadway cameras, and highway truck travel information. The fiber system also has other regional and redundancy benefits by augmenting current CDOT networks. An additional benefit of incorporating this project into an existing transmission line project would reduce CDOT's cost from burying fiber optic cable, estimated at up to $300,000 per mile. Moreover, increased demand for electric vehicles would increase the demand for electrical energy to charge vehicle batteries beyond the capacity of current generation and transmission systems. Pawnee Express would have the potential to deliver up to 1,200 MW of clean, renewable electricity to facilitate the transition to electric vehicles for the residents of Colorado.

B. **Identify the commensurate private contribution in conjunction with the public asset utilized to implement the project such as cash, equal sharing of proposer's fiber optic infrastructure within or outside project limits, maintenance including locates and splicing, other in-kind benefits, e.g., engineering services, and describe how the commensurate private contribution was calculated.** The proposal includes OPGW fiber cable strung on top of the 345kv transmission line that is co-used by the Pawnee Express for transmission related activities. Since the fiber comes in bundled strands, it is easy to isolate fibers that are dedicated to the CDOT mission. The fiber pull / splice boxes can be dictated at a pre-arranged distances based upon CDOT's needs. As part of the T-Line project, Pawnee Express would assume all engineering, material, installation, and testing costs for fiber installed on our transmission line.

RULES and REGULATIONS
of the
Colorado Department of Transportation

PERTAINING TO ACCOMMODATING UTILITIES IN THE STATE HIGHWAY RIGHTS OF WAY

2 C.C.R. 601-18

Effective January 14, 2021

RULES and REGULATIONS
of the
Colorado Department of Transportation

PERTAINING TO ACCOMMODATING UTILITIES IN THE STATE HIGHWAY RIGHTS OF WAY

2 C.C.R. 601-18

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DEPARTMENT OF TRANSPORTATION

Transportation Commission

STATE HIGHWAY UTILITY ACCOMMODATION CODE

2 CCR 601-18

1.0 GENERAL PROVISIONS

1.1 Statement of Basis

1.1.1 The basis of the State Highway Utility Accommodation Code (Code) is the need to serve the public good through the safe, efficient and effective joint utilization of State Highway Right-of-Way (SH ROW) for both transportation and utility purposes.

1.1.2 The Code is necessary to establish a uniform and consistent statewide process for accommodating utilities within SH ROW by means of reasonable regulations to ensure that such accommodations do not adversely affect the highway or traffic safety, or otherwise impair the operation, aesthetic quality or maintenance of the transportation facility, or conflict with applicable law.

1.1.3 Utility facilities provide an essential service to the general public, but every accommodation must be compatible with and not adversely affect the existing and future needs of the transportation facility.

1.1.4 The Code is being implemented in an effort to conserve limited public resources, preserve future options, and minimize conflicts between highway and utility facilities. The reasonable regulations in the Code ensure such accommodations.

1.1.5 As part of the regulatory review process, the Colorado Department of Transportation (Department) has conducted a thorough review of these rules, and where possible has eliminated unnecessary language, and has updated the rules based on changes in law or practice.

1.2 Specific Statutory Authority

1.2.1 § 43-1-225(1), C.R.S., gives the Transportation Commission (Commission) authority to make reasonable regulations for accommodation of certain utilities in, on, along, over, across, through, or under SH ROW. Also, the Department has responsibility and authority under §§ 43-1-110 and 43-2-102, C.R.S., for the design, construction, improvement, maintenance and management of the State highway system and SH ROW. The Department also has authority to implement procedures for the performance of utility relocation work pursuant to § 43-1-1409(1)(b), C.R.S. § 43-1-106(8)(k), C.R.S., further authorizes the Commission to make all necessary and reasonable regulations with respect to the responsibilities of the Department for the State highway system. Finally, the Commission has authority under the police power to regulate the accommodation of utility facilities within SH ROW to the extent that regulation is necessary to protect the public safety and welfare.

1.2.2 While utilities have certain statutory authority to place their facilities within SH ROW, §§ 32-1-1006(1)(c), 32-4-406(1), 32-4-510(1), 38-5-101, and 38-5.5-103(1), C.R.S., that authority is subject to reasonable regulation by the Department to ensure that the facilities do not unreasonably impair transportation purposes. While local agencies have certain authority to allow utilities in streets that are also SH ROW pursuant to §§ 43-2-135(1), 31-15-702(1), and 38-5-108, C.R.S. and also Article XXV of the Colorado Constitution, that authority must be construed harmoniously with the primary authority of the Commission and the Department to regulate the accommodation of utility facilities in the SH ROW, as provided in the Code, in order to ensure statewide uniformity.

1.3 Purpose

1.3.1 The purpose of the Code is to implement, by permit, Commission and Department authority to regulate utility accommodations in SH ROW.

1.3.2 The Code must comply with applicable federal provisions.

1.4 Definitions and References

1.4.1 Abbreviations: As used in the Code these abbreviations shall have the following meaning:

1.4.1.1 AASHTO: American Association of State Highway and Transportation Officials

1.4.1.2 CCR: Code of Colorado Regulations

1.4.1.3 CDOT: Colorado Department of Transportation (Department)

1.4.1.4 CDPHE: Colorado Department of Public Health and Environment

1.4.1.5 C.F.R.: Code of Federal Regulations

1.4.1.6 CDPS: Colorado Discharge Permit System

1.4.1.7 C.R.S.: Colorado Revised Statutes

1.4.1.8 FHWA: Federal Highway Administration

1.4.1.9 MPH: Miles per Hour

1.4.1.10 MS4: Municipal Separate Storm Sewer System

1.4.1.11 MUTCD: The FHWA "Manual on Uniform Traffic Control Devices" and the Colorado supplement thereto as adopted by the Commission pursuant to § 42-4-104, C.R.S.

1.4.1.12 OSHA: Occupational Safety and Health Administration

1.4.1.13 PUC: Colorado Public Utilities Commission

1.4.1.14 ROW or SH ROW: Highway Right Of Way or State Highway ROW under CDOT jurisdiction

1.4.1.15 §: A Section of C.F.R. or C.R.S.

1.4.1.16 UNCC: Utility Notification Center of Colorado

1.4.1.17 U.S.C.: United States Code

1.4.1.18 WQCD: Water Quality Control Division at the Colorado Department of Public Health and Environment

1.4.2 Definitions

1.4.2.1 ABANDONED: The cessation of ownership, use, and operation of a utility facility. Also see “Retirement” in these definitions.

1.4.2.2 ACCOMMODATION: The location, installation, construction, operation, maintenance, repair, renewal, relocation or presence of utility facilities.

1.4.2.3 ADJUSTMENT: A modification of an existing utility facility.

1.4.2.4 AESTHETIC QUALITY: Those desirable characteristics in the appearance of the highway and its environment, such as harmony between or blending of natural or manufactured objects in the environment, continuity of visual form without distracting interruptions, and simplicity of designs which are desirably functional in shape but without clutter.

1.4.2.5 APPLICANT: The person or entity that prepares a utility permit application on behalf of the utility owner.

1.4.2.6 AS-CONSTRUCTED PLAN: also known as "As-Built Plan" is a plan updated throughout construction that includes all changes and modifications that occur during the construction phase of a project.

1.4.2.7 BACKFILL: Replacement of suitable material as specified around and over a pipe, conduit, casing or gallery.

1.4.2.8 BEDDING: Organization of soil or other suitable material to support a pipe, conduit, casing or gallery.

1.4.2.9 BORE: The excavation of an underground circular cavity for the insertion of a pipe or other type of conduit. Also see “Trenchless.”

1.4.2.10 BRIDGE: A structure, including supports, erected over a depression or obstruction, such as water, a highway, or railroad, and having a track or passageway for carrying traffic or other moving loads and having a length measured along the center of roadway of more than twenty (20) feet between undercopings of abutments or extreme ends of openings for multiple boxes.

1.4.2.11 BRIDGE ATTACHMENT: Clamps, connectors, hangers, or other devices, subject to approval by the Department, required for securing utilities to a bridge.

1.4.2.12 CALENDAR DAY: Each and every day shown on the calendar, beginning and ending at midnight. When “day” is used, it shall mean calendar day unless otherwise specified.

1.4.2.13 CAP: Rigid structural element surmounting a pipe, conduit, casing, or gallery.

1.4.2.14 CARRIER: Pipe directly enclosing a transmitted fluid in a liquid or gaseous state.

1.4.2.15 CASING: A larger pipe enclosing a carrier. The cell of a box girder does not qualify as a casing. Tunnels or galleries may function as casing pipes.

1.4.2.16 CATHODIC PROTECTION: A method of controlling corrosion through the use of an induced electrical current and sacrificial anodes.

1.4.2.17 CLEAR ZONE: The unobstructed, traversable area provided beyond the edge of the traveled way for the recovery of errant vehicles. The clear zone includes shoulders, bike lanes, and auxiliary lanes, except those auxiliary lanes that function like through lanes.

1.4.2.18 COATING: Material applied to or wrapped around a pipe.

1.4.2.19 CONDUCTOR: Wire carrying electric current.

1.4.2.20 CONDUIT or DUCT: An enclosed tubular runway for protecting wires or cables.

1.4.2.21 COVER or COVER DEPTH or DEPTH OF COVER: The depth to the top of pipe, conduit, casing or gallery below grade of roadway or ditch.

1.4.2.22 CRADLE: Rigid structural element below and supporting a pipe.

1.4.2.23 CROSSING: The utility crossing of the SH ROW plus isolated segments of utility lines which may parallel the highway for not more than five hundred (500) feet.

1.4.2.24 DAY: Means a calendar day, unless specifically stated otherwise in the applicable text of the Code.

1.4.2.25 DEPARTMENT: The Colorado Department of Transportation.

1.4.2.26 DESIGN-BUILD CONTRACT: The procurement of both the design and construction of a transportation project in a single contract with a single design-build firm or a combination of such firms capable of providing the necessary design and construction services.

1.4.2.27 DESIGNATED REPRESENTATIVE: An authorized, appointed representative of the Department, local agency, utility owner or permittee.

1.4.2.28 DIVIDED HIGHWAY: A highway with separated roadways usually for traffic moving in opposite directions, such separation being indicated by depressed dividing strips, raised curbings, traffic islands, or other physical barriers so constructed as to impede vehicular traffic or otherwise indicated by standard pavement markings or other official traffic control devices as prescribed in the state traffic control manual.

1.4.2.29 DRAIN: Appurtenance designed to discharge liquid.

1.4.2.30 EASEMENT: An interest in real property that conveys a right to use a portion of an owner’s property or a portion of an owner’s rights in the property.

1.4.2.31 EMERGENCY: Where circumstances imperatively require immediate action to comply with a State or federal law or federal regulation or for the preservation of the public health, safety or welfare.

1.4.2.32 ENCASEMENT: A structural element surrounding a pipe, which may include boxing or jacketing in trenched installations, or grouting in trenchless installations.

1.4.2.33 EXPRESSWAY: A divided highway with partial control of access.

1.4.2.34 FEDERAL AID HIGHWAY: A public highway eligible for assistance under Chapter 1 of Title 23 of the United States Code other than a highway functionally classified as a local road or rural minor collector.

1.4.2.35 FEDERAL AID HIGHWAY PROJECTS: Active or completed highway projects administered by or through a State highway agency which involve or have involved the use of federal aid highway funds for the development, ROW acquisition, construction, or improvement of highway or related facilities, including highway beautification projects.

1.4.2.36 FLOWABLE BACKFILL: A low-cement-content aggregate mixture developed as an alternative to conventional trench backfilling methods, to facilitate the backfilling operation and expedite the restoration of a pavement surface.

1.4.2.37 FORCE MAJEURE: is a “superior force,” such as natural and unavoidable catastrophes that interrupt the expected course of events and restrict participants from fulfilling obligations. It is a common clause in contracts to free both parties from liability or obligation when an extraordinary event or circumstance beyond the control of the parties, such as a war, strike, riot, crime, or an event described by the term "act of God" (e.g., flooding, earthquake, volcano), prevents one or both parties from fulfilling their obligations under the contract. It does not excuse negligence or other malfeasance of a party, as where non-performance is caused by the usual and natural consequences of external forces, or where the intervening circumstances are specifically contemplated.

1.4.2.38 FREEWAY: A divided highway with full control of access.

1.4.2.39 FRONTAGE ROAD: A local street or road auxiliary to and located on the side of a highway for service to abutting property and adjacent areas for control of access.

1.4.2.40 FULL CONTROL OF ACCESS: The access control which provides for a preference to through traffic by providing access connections only with selected public roads and by prohibiting at-grade crossings and direct private driveway connections.

1.4.2.41 GALLERY: An underpass for two or more utility lines.

1.4.2.42 GRADE SEPARATION: A crossing of two roadways, or a roadway and railroad, at different levels.

1.4.2.43 GRAVITY-FED SYSTEM: any underground facility that is not pressurized and that utilizes gravity as the only means to transport its contents. These systems include sanitary lines, storm sewer lines, irrigation lines, and open-air irrigation ditches.

1.4.2.44 GROUT: A cement mortar or a slurry of fine sand or clay.

1.4.2.45 HEAVY WALL THICKNESS PIPE: Pipe meeting the industry standard for this specific designation.

1.4.2.46 HIGHWAY: The entire width between boundary lines of every way publicly maintained when any part thereof is open to use of the public for purposes of vehicular travel or the entire width of every way declared to be a public highway by any law of this State.

1.4.2.47 HIGHWAY AGENCY: That department, agency, commission, board, or official of any state or political subdivision thereof, charged by its law with the responsibility for highway administration.

1.4.2.48 HIGHWAY PURPOSE: Pertaining to the planning, design, construction, operation, maintenance, or improvement of any portion of the highway facility or function thereof, or to any lawful duty or act of a highway agency.

1.4.2.49 HIGHWAY PROPERTY: SH ROW, Port of Entry, and all improvements constructed thereon for highway purposes, including but not limited to such elements as: roadway template, pavement, subgrade, roadside areas, curbing, traffic barriers, highway structures, landscaping, irrigation and drainage systems, lighting, traffic signal systems, delineation, pavement markings and survey monumentation.

1.4.2.50 HIGHWAY STRUCTURE: Any structure constructed for the purpose of carrying vehicular, rail, or pedestrian traffic over a depression, stream, obstacle, roadway, walkway, or railroad.

1.4.2.51 HOLIDAY: Holidays recognized by the State of Colorado are: New Year's Day, Dr. Martin Luther King Jr. Birthday (observed), President's Day, Memorial Day, Independence Day, Labor Day, Frances Xavier Cabrini Day, Veteran's Day, Thanksgiving Day, Christmas Day. When a holiday falls on Sunday, the following Monday shall be considered a holiday, and when a holiday falls on a Saturday, the preceding Friday shall be considered a holiday. Cesar Chavez Day (March 31) may be considered a holiday, and, will be noted on the completed permit if applicable. Additional legal holidays, when designated by the Governor or the President of the United States, may also be recognized by the State. When a local agency has issuing authority for a permit, such other day(s) as the local agency may designate shall also be considered holiday(s) for the purpose of the permit.

1.4.2.52 INSPECTOR: A designated representative of the Department who is assigned to make detailed inspections of utility permit activities in order to verify compliance with the Code and with the terms and conditions of an approved permit.

1.4.2.53 INSTALLATION: A utility facility or portion thereof, which is placed within SH ROW or property owned by non-private entities, or the act of making same.

1.4.2.54 INTERCHANGE: A facility that grade separates intersecting roadways and provides directional ramps for access movements between the roadways. The structure and the ramps are part of the interchange.

1.4.2.55 INTERSTATE: A highway that is included as part of the national system of interstate and defense highways.

1.4.2.56 ISSUING AUTHORITY: The authority vested in the appropriate government agency to issue a permit in accordance with the Code to accommodate a utility in SH ROW.

1.4.2.57 JACKET or BOX: Encasement by concrete poured around a pipe or utility when proper depth cannot be obtained.

1.4.2.58 JACKING: Pushing a pipe horizontally under a roadway by mechanical means, with or without boring.

1.4.2.59 JETTING: Pushing a pipe through a roadway embankment using water under pressure to create a cavity ahead of the pipe. Jetting is different from Wet Boring, which is defined herein.

1.4.2.60 JOINT USE: The use of pole line, trenches, duct systems, or other facilities by two or more utilities in order to conserve SH ROW.

1.4.2.61 LEAK-PROOF CONSTRUCTION: Methods to ensure against leakage in pipelines, including welded or mechanical leak-proof joints, and/or quality assurance measures such as radiographic or hydrostatic testing and certification of welds and joints.

1.4.2.62 LOCAL AGENCY: The city, city and county, or incorporated town within whose jurisdiction the utility will be accommodated in the ROW of a street that is also a State highway.

1.4.2.63 LOCAL STREET: A street that is a part of a system of streets established in each city, city and county, and incorporated town, known as the city street system. It shall not include any street established by law as a part of the state highway system.

1.4.2.64 LONGITUDINAL: Parallel or nearly parallel to the approximate alignment of the highway for more than five hundred (500) feet.

1.4.2.65 MAINTENANCE: The servicing and repair of an existing facility as necessary to keep the facility in safe and acceptable operating condition.

1.4.2.66 MAJOR CHANGE: An alteration in the scope, location, nature, or cost of the work and includes but is not limited to:

1.4.2.66.1 changing a facility from aerial to underground; or

1.4.2.66.2 changing the location of a highway crossing; or

1.4.2.66.3 a shift from one side of the highway to another; or

1.4.2.66.4 any increase in plant capacity; and

1.4.2.66.5 changing from boring to open cut installation.

1.4.2.67 MANHOLE: An opening in an underground system which workmen, or others may enter for the purpose of making installations, repairs, connections or tests.

1.4.2.68 MARKER: A pole or other object placed over or near a buried facility to denote the facility’s alignment.

1.4.2.69 MEDIAN: That portion of the highway separating the opposing traffic flows.

1.4.2.70 METHOD OF HANDLING TRAFFIC (MHT): A site-specific traffic control plan that describes the traffic control measures that may or will be taken in a particular phase of a permit operation or in a particular situation that may be encountered.

1.4.2.71 MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4). A conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains):

1.4.2.71.1 Owned or operated by a state, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to state law) having jurisdiction over disposal of sewage, industrial wastes, stormwater, or other wastes. This includes special districts under state law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under the Clean Water Act, 33 U.S.C. § 1251, *et seq.*, that discharges to waters of the United States;

1.4.2.71.2 Designed or used for collecting or conveying stormwater; and

1.4.2.71.3 Which is not a combined sewer; and

1.4.2.71.4 Which is not part of a Publicly Owned Treatment Works (POTW). See 5 CCR 1002-61.2(62).

1.4.2.72 NIGHT: The period between one hour before sunset and one hour after sunrise, or as specified in the Utility Permit.

1.4.2.73 PARTIAL CONTROL OF ACCESS: The authority to control access is exercised to give preference to through traffic to a degree that, in addition to access connections with selected public roads, there may be some crossings at-grade and some private driveway connections.

1.4.2.74 PAVEMENT CUT: The removal of an area of pavement for the purpose of placing or maintaining a utility facility.

1.4.2.75 PAVEMENT STRUCTURE: The combination of subbase, base course, and surface course placed on a subgrade to support and distribute the traffic load to the roadbed.

1.4.2.76 PERMIT: The written document by which the Department regulates and/or gives approval of the use and occupancy of the SH ROW by utility facilities or private lines, and which sets forth the approved terms and conditions under which a utility or utility facility may be accommodated within SH ROW. A permit is permissive authority that does not convey any compensable property interest to the permittee. Permits shall be issued only to the actual facility owner.

1.4.2.77 PERMITTEE: The entity that owns and operates and maintains the utility facility, and that is responsible for fulfilling all the terms and conditions of the permit; or, as accepted by the Department, the utility owner's designated representative, authorized by the owner, to carry out any or all permitted activities.

1.4.2.78 PIPE: A tubular product made as a production item and for sale as such. Cylinders formed from plate in the course of fabrication of auxiliary equipment are not pipe as defined herein.

1.4.2.79 PLOWING: Direct burial of utility lines by means of a "plow" type mechanism which breaks the ground, places the utility line and closes the break in the ground in a single operation.

1.4.2.80 PORT OF ENTRY: Fixed or mobile weight stations operated by Port of Entry officers authorized by statute to engage in commercial vehicle size, weight and safety enforcement and to facilitate the enforcement and collection of applicable fees, licenses, or taxes imposed upon motor carriers and the owners and operators of motor vehicles using the public highways of the state of Colorado.

1.4.2.81 PRESSURE: Relative internal pressure in pounds per square inch (PSI) gauge.

1.4.2.82 PRIVATE LINE: Privately owned facilities, which convey or transmit commodities outlined in the definition herein for "utility facility," but devoted exclusively for private use.

1.4.2.83 RECORD SET is a final set of design plans and specifications issued for construction which is sealed by a licensed professional engineer. The Applicant is responsible for determining if the design requires the oversight of a licensed professional engineer subject to the concurrence and approval by the Department.

1.4.2.84 REGION: A geographical subdivision of the state of Colorado established by the Department for administrative purposes.

1.4.2.85 RELOCATION: The adjustment of utility facilities required by the highway project or other highway purpose. It includes removing and reinstalling the facility, including necessary temporary facilities, acquiring necessary right of way on the new location, moving, rearranging or changing the type of existing facilities and taking any necessary safety and protective measures. It shall also mean constructing a replacement facility that is both functionally equivalent to the existing facility and necessary for the continuous operation of the utility service, the project economy, or sequence of highway construction.

1.4.2.86 REST AREA: A roadside area with parking facilities separated from the roadway provided for motorists to stop and rest for short periods. It may include drinking water, toilets, tables and benches, telephones, information and other facilities for travelers.

1.4.2.87 RETIREMENT: The cessation of use and operation of a utility facility that remains under the utility's ownership.

1.4.2.88 RIGHT-OF-WAY (ROW): Department-controlled property, or interests therein, acquired, dedicated or reserved for the construction, operation, and maintenance of the State highway system.

1.4.2.89 ROADSIDE: A general term denoting the area adjoining the outer edge of the roadway. Extensive areas between the roadways of a divided highway may also be considered roadside.

1.4.2.90 ROADWAY: That portion of a highway improved, designed or ordinarily used for vehicular travel exclusive of the berm or shoulder. In the event a highway includes two or more separate roadways, “roadway” refers to any such roadway separately but not to all such roadways collectively.

1.4.2.91 ROADWAY TEMPLATE: The area of the constructed or proposed road embankment from road centerline across the traveled lane(s) and shoulder, then down to a drainage ditch, then up to an intercept with natural ground in a cut section, or from the shoulder down to an intercept with natural ground in a fill section.

1.4.2.92 RURAL AREA: Any segment of the State highway system not considered to be in an urban area.

1.4.2.93 SHOULDER: A portion of the roadway template immediately adjacent to the traveled lane.

1.4.2.94 SPECIAL PROVISIONS: Terms and conditions of a permit, imposed by the Department, which are consistent with but not otherwise set forth in the Code and which address unique or variable circumstances particular to a given installation.

1.4.2.95 STANDARD PROVISIONS: Standardized terms and conditions of a permit that reflect specific Code requirements and which apply in most situations.

1.4.2.96 STATE HIGHWAY (SH): A highway on the State highway system.

1.4.2.97 STATE HIGHWAY SYSTEM: All highways under Department jurisdiction and control and declared as such by the Commission pursuant to § 43-2-101, C.R.S.

1.4.2.98 STRUCTURE ATTACHMENT: A utility attached to or installed within a highway structure.

1.4.2.99 SURVEY PLAN: Includes all documents, plats, and reports resulting from the practice of land surveying that shall be identified with and bear the seal, the signature, and date of signature of the land surveyor in responsible charge. A professional land surveyor shall use a seal and signature when the work to which the seal is applied was prepared under the professional land surveyor's responsible charge pursuant to the Architects, Professional Engineers, and Professional Land Surveyors Rules and Regulations, 4 CCR 730-1.

1.4.2.100 TRAFFIC CONTROL PLAN (TCP): The planned utilization of MHT and of traffic control devices, as necessary, to ensure the safe and expeditious movement of traffic around and through the utility work site and the safety of the utility work force.

1.4.2.101 TRAFFIC CONTROL SUPERVISOR (TCS): The on-site person in direct responsible charge for implementing the TCP and shall be certified as a worksite traffic supervisor by either the American Traffic Safety Services Association or the Colorado Contractors Association, and shall have a current CDOT flagger certification card.

1.4.2.102 TRAVELED WAY: The portion of the roadway for the movement of vehicles, exclusive of shoulders and auxiliary lanes.

1.4.2.103 TRENCHED: Installed in a narrow open excavation.

1.4.2.104 TRENCHLESS: Installed using a method where no trench is excavated, such as microtunneling, jacking or horizontal directional drilling.

1.4.2.105 UNDERGROUNDING: The act of burying a line, cable, or conduit, and in context may refer in particular to the act of replacing an existing aerial facility with a buried facility.

1.4.2.106 URBAN AREA: An area where residences or businesses are clustered, not necessarily within municipal boundaries, where frequent approaches, utility lines, and drainage facilities are likely to be encountered, and where potential exists for future widening of the road to accommodate anticipated traffic growth.

1.4.2.107 UTILITY or UTILITY FACILITY: Any privately, publicly or cooperatively owned line, facility, or system for producing, transmitting, or distributing communications, cable television, power, electricity, light, heat, gas, oil, crude products, water, steam, waste, storm water not connected with highway drainage, or any other similar commodity, including any fire or police signal system or street lighting system, which directly or indirectly serves the public. The term utility shall also mean the utility company inclusive of any substantially owned or controlled subsidiary. For the purposes of the Code, the term includes those utility-type facilities which are owned or leased by a government agency for its own use, or otherwise dedicated solely to governmental use. The term utility includes those facilities used solely by the utility which are part of its operating plant. As the context provides, the term utility may also relate to an action or requirement of a "permittee."

1.4.2.108 VARIANCE: A deviation from a specific requirement of the Code, requested by a utility owner or permittee, that if approved, is deemed consistent with the purpose and intent of the Code, and is reasonably necessary for the convenience, safety, and welfare of the public.

1.4.2.109 VENT: Apparatus to discharge all gaseous contaminants from a casing.

1.4.2.110 WET BORING/HORIZONTAL DIRECTIONAL DRILLING (HDD): To bore using water or slurry mix under pressure at the cutting auger to soften the earth and to sluice out the excavated material.

1.4.2.111 WORKING DAY: Any day that the permittee can perform a normal day of work, exclusive of delays which result from inclement weather, labor disputes, material shortages and other factors beyond the permittee's control. It does not include any weekends or legal holidays.

1.5 Applicability and General Provisions

1.5.1 The Code shall apply only to utility accommodations on SH ROW.

1.5.2 The Department will issue a permit only if the utility accommodation complies with the Code, and is not otherwise detrimental to the highway facility or to the health, welfare and safety of the public.

1.5.3 The Department may include permit terms and conditions deemed reasonably necessary to give effect to the purpose, scope or requirements of the Code.

1.5.4 Where language of the Code requires particular action to be taken or omitted, but does not specifically identify the responsible party, such requirements shall apply to and be the sole responsibility of the utility owner, as the context provides.

1.5.5 Where the language of the Code does not impose a particular obligation, but expressly indicates that a requirement or condition "will be specified," or "otherwise approved," or "may be required," or "may be necessary," or that the "Department may require a utility to take further action," the Code anticipates that such requirement or condition or action, if any, will be described by the Department in the permit. Such a requirement, condition or action will be applicable to the utility owner only if specifically described in the issued permit.

1.5.6 The Code does not invalidate utility permits or agreements issued or entered into prior to the effective date of the Code. However, to the extent the Code requires a utility to take reasonably necessary action in order to protect the public health, welfare and safety, or to prevent unreasonable interference with a State highway, existing utilities shall be subject to such requirements. The utility must take such actions upon written notice.

1.6 Material Incorporated by Reference

The following regulations and standards are incorporated by reference pursuant to § 24-4-103(12.5), C.R.S.; such incorporation does not include later amendments or editions of any incorporated material. As part of the Code and by this reference, such material is incorporated but only to the extent such material is consistent with the express provisions of the Code:

1.6.1 Federal Laws, Regulations, and Standards

1.6.1.1 23 C.F.R. § 1.23, "Rights of Way," October 28, 2019

1.6.1.2 23 C.F.R. Subpart 645A, "Utility Relocations, Adjustments, and Reimbursement," October 28, 2019

1.6.1.3 23 C.F.R. Subpart 645 B, "Accommodation of Utilities," October 28, 2019

1.6.1.4 49 C.F.R. Part 192, "Transportation of Natural and Other Gas by Pipeline; Minimum Safety Standards" August 06,2020

1.6.1.5 49 C.F.R. Part 195, "Transportation of Liquids by Pipeline; Minimum Safety Standards") August 06, 2020

1.6.2 National and Industry Standards

1.6.2.1 "A Guide for Accommodating Utilities Within Highway Right-of-Way," AASHTO, 4th edition, October 2005

1.6.2.2 "A Policy on the Accommodation of Utilities Within Freeway Right-of-Way," AASHTO, 5th edition, October 2005

1.6.2.3 "Roadside Design Guide", AASHTO, 4th edition, 2011, reprinted February 2012

1.6.2.4 "Recommended Practice for Liquid Petroleum Pipelines Crossing Railroads and Highways," American Petroleum Institute, Division of Transportation, API Recommended Practice 1102, 7th edition, December 2007 with March 2014 errata

1.6.2.5 "Manual for Assessing Safety Hardware (MASH)," AASHTO, 2nd edition, 2016 Year Published

1.6.2.6 "Manual on Uniform Traffic Control Devices (MUTCD)," FHWA, 2009 edition with Revision Numbers 1 and 2 Incorporated, dated May 2012.

1.6.3 Copies of Incorporated Material

Copies of the national and industry standards are maintained by the CDOT State Utilities Engineer and are available for public inspection during regular business hours at the Colorado Department of Transportation, 2829 W. Howard Pl., Denver, CO 80204.

1.6.3.1 Copies of the referenced United States Code may be obtained from the following address:

Office of the Law Revision Counsel
U.S. House of Representatives
H2-308 Ford House Office Building
Washington, DC 20515
(202) 226-2411
https://uscode.house.gov/

1.6.3.2 Copies of the referenced Code of Federal Regulations may be obtained from the following address:

U.S. Government Publishing Office
732 North Capitol Street, N.W.
Washington, DC 20401
(202) 512-1800
https://www.govinfo.gov/

1.6.3.3 Copies of the MUTCD may be obtained from the following address:

Office of Transportation Operations
Federal Highway Administration, Mail Stop: E84-402
1200 New Jersey Avenue, S.E.
Washington, DC 20590
https://mutcd.fhwa.dot.gov/

1.6.3.4 Copies of AASHTO publications may be obtained from the following address:

AASHTO Publications Order Department
P.O. Box 933538
Atlanta, GA 31193
(800) 231-3475
https://store.transportation.org/.

1.6.3.5 Copies of publications from the American Petroleum Institute may be obtained from the following address:

API
1220 L Street, NW
Washington, DC 20005
(202) 682-8000
https://www.api.org/products-and-services/standards/purchase#tab-catalog

1.6.4 Conflict in Laws

These Rules are written to comply with and implement the Colorado Revised Statutes and the federal regulations referenced herein. If any provision of these Rules or their application is held illegal, invalid, or unenforceable, no other provisions or applications of the Rules shall be affected and to this end the provisions of these Rules are severable. If these Rules conflict with relevant federal or state law, the federal or state law shall govern.

2.0 PROCEDURES

2.1 General

2.1.1 Local Agency Authority to Issue Permits in the SH ROW

2.1.1.1 The Department has the authority and primary responsibility to issue permits for utility accommodations on all SH ROW, including State highways that may also be local streets within the local agency jurisdiction. Any work outside of the roadway may require a separate permit from the local agency.

2.1.1.2 If an application requests utility accommodation on a State highway that is also a local street within the local agency jurisdiction, the Department shall, if requested by the local agency, consult with the local agency before the Department acts on the application and/or the terms and conditions of the permit.

2.1.1.3 The Department may, upon written request by a local agency and prior approval thereof by the Department, delegate the authority described in the above Section 2.1.1.2 to a local agency for State highways within its jurisdiction, subject to the following conditions:

2.1.1.3.1 The local agency's written request must be executed by the person authorized to obligate the local agency on utility matters.

2.1.1.3.2 Under any delegation, the Department shall remain the sole issuing authority for utility permits on all State highways designated as freeways or expressways.

2.1.1.3.3 Any permit issued by the local agency shall include all terms and conditions necessary to ensure compliance with the Code.

2.1.1.3.4 Upon written request from the local agency, the Department will assist with permit applications received by the local agency, including but not limited to reviewing an application, recommending permit action, and/or preparing a permit for local agency issuance.

2.1.1.3.5 If requested by the Department, the local agency shall promptly furnish the Department with copies of all permits issued, and of applications denied together with reasons for denial.

2.1.1.3.6 The local agency shall be responsible to ensure minimum Code compliance with all terms and conditions of any permit issued, and to hear and decide any appeals of its permitting decisions.

2.1.1.3.7 The permit shall expressly provide that the Department may, at any time, inspect the site of work authorized by the permit.

2.1.1.3.8 Any locally adopted utility accommodation standards that are imposed through a permit shall meet the minimum applicable requirements of the Code.

2.1.1.3.9 The permit shall expressly provide that the Department shall retain authority to take immediate remedial action concerning permitted work to attain compliance with the Code or with permit conditions, or as otherwise required for the public health, welfare and/or safety.

2.1.1.3.10 The local agency may relinquish the delegated authority upon written notice to the Department, and the Department may withdraw its delegation of authority upon written notice to the local agency.

2.1.1.3.11 The Department reserves the right to issue utility relocation permits.

2.1.2 Responsibility for Utility Accommodation Costs and Damages on Department Projects

2.1.2.1 The utility owner shall be responsible for all costs relating to the accommodation of its facilities within the SH ROW, or their relocation from the SH ROW and the Department shall have no responsibility for any costs of any utility accommodation, except as expressly provided otherwise in this Section or in a permit or written agreement.

2.1.2.2 The Department shall give written notice to the utility when the utility fails to fulfill any requirement of the Code or the provisions of its permit. The Department shall allow the utility the opportunity to remedy within the time set by the Department in its written notification. Extensions may be granted upon written request showing good cause. If a utility does not remedy the failure to comply with any requirement or provision, the Department, may elect in its discretion to perform the work by any other suitable means. In that event, the utility shall be liable to the Department for all costs reasonably and actually incurred by the Department for that performance. All costs shall be itemized to the extent practicable. The utility shall pay that amount plus interest at the statutory rate to the Department not later than 30 days after receipt of the Department’s bill. Any such amounts not paid may be used to offset future fiscal Department obligations to the utility.

2.1.2.3 The utility company shall pay for damages caused by the company's delay in the performance of utility relocation work or interference with the performance of transportation project work done by others. Such damages may include, but are not limited to, payments made by the Department to any third party based on a claim that performance of the transportation project work was delayed or interfered with as a direct result of the utility company's failure to timely perform the utility relocation work. Project delay damages shall be tied to the project’s critical path schedule so as to demonstrate a timeline of events leading up to the utility's failure to perform the work and subsequent delay to the project. This information will be provided to the utility in advance and is subject to the following additional provisions:

2.1.2.3.1 Damages resulting from delays in the performance of the utility company's relocation work or interference with the transportation project work caused by Force Majeure or events beyond the utility company's ability to reasonably foresee or control shall not be charged to the utility company.

2.1.2.3.2 If damages are charged against the utility, the Department may withhold issuance of a permit until such damage charges are paid, or deduct damage charges from any outstanding accounts for relocation reimbursement agreements with that utility company.

2.1.2.3.3 For utility relocations arranged through Design-Build Contracts, damage charges and the potential withholding of permits are subject to Part 14 of Title 43, C.R.S.

2.1.2.4 The Department will reimburse a utility for the costs of relocating its facility only where any of the following conditions exist:

2.1.2.4.1 the Utility has the right of occupancy in its existing location because it holds the fee, an easement, or other real property interest, the damaging or taking of which is compensable in eminent domain; or

2.1.2.4.2 the facilities are owned by a governmental subdivision of the State of Colorado or an abutting landowner, as provided in § 43-1-225, C.R.S.; or

2.1.2.4.3 the provisions of § 43-1-1411, C.R.S. apply with respect to certain relocation costs associated with a Design-Build Contract; or

2.1.2.4.4 the facilities exist to serve a highway purpose.

2.1.2.5 Except as otherwise provided in § 43-1-1411(5), C.R.S., when in the acquisition of new SH ROW, the Department overtakes a utility's real property interest, the Department may:

2.1.2.5.1 acquire a replacement property interest for the utility or reimburse the utility for the reasonable cost of acquiring its own replacement interest, the reasonableness of which will be determined by the Department after consultation with the utility; or

2.1.2.5.2 where it is not necessary, by virtue of the nature of the transportation project to relocate utility facilities, the Department may enter into a common use agreement or other type of agreement with the utility that allows a property interest to exist within SH ROW; or

2.1.2.5.3 if the utility must relocate within the SH ROW and if a replacement interest is not acquired, the utility may be justly compensated to the extent allowable in accordance with Colorado eminent domain law and precedent for the value of its real property interest; or

2.1.2.5.4 if the relocation of a utility's facility is necessitated by a transportation project and the utility elects to relocate its facilities within the SH ROW, the Department may enter into a common use agreement or a utility permit with the utility that allows reimbursement for future relocations of the utility's facilities provided that the utility vacates all property interest that exists within the SH ROW.

2.2 Utility Permits and Utility Relocation Permits to the State Highway

2.2.1 Requirement to Obtain a Permit

2.2.1.1 Utility owners must obtain a permit from the Department prior to performing any utility accommodation work, including the initial installation, relocation, system upgrades, maintenance activities not covered under existing permit, or facilities removal.

2.2.1.2 The utility must obtain a new or revised permit for any work which is not expressly described in the language of the scope of work of an existing permit. The Department may issue an annual maintenance permit, depending upon the utility type, for planned or emergency maintenance activities, traffic and roadway characteristics.

2.2.1.3 Applications for utility permits and utility relocation permits, shall be on Department-prescribed forms, unless issuing authority for permits has been delegated to a local agency.

2.2.1.4 The utility shall comply with all applicable requirements of the Code, and if a permit is issued, with all terms and conditions of that permit.

2.2.1.5 A utility shall not perform any utility accommodation work without first obtaining a permit issued by the Department or delegated issuing authority.

2.2.2 Application for a Utility Permit

2.2.2.1 An applicant must submit an application for a permit to the appropriate Region Utility Permit Office where the accommodation is requested. CDOT region offices are located in Denver, Durango, Grand Junction, Greeley, and Pueblo. For permitting purposes the Durango region is further subdivided into Durango and Alamosa offices. Contact names, addresses, phone/fax numbers and e-mail addresses are available online from the CDOT Utility Code website (https://www.codot.gov/business/permits/utilitiesspecialuse/permit-process.html).

2.2.2.2 The application must be submitted through the Department's prescribed CDOT Form #1233, which is available from the Department's regional offices or online. The application must include a complete description of the purpose, nature and specific location of planned work, and the anticipated start and completion dates for that work. The application must include a scope of the proposed activities to be covered by a permit, including type and size of utility facility, proposed utility plans, traffic control plans, insurance certificate, methods used to perform the work. The application must describe that information in sufficient detail to enable the Department to determine exactly what work is proposed.

2.2.2.3 Permits are only issued in the name of the utility owner. If the applicant is other than the utility owner, the application must include written evidence granting the applicant's authority to act as an agent for the utility owner. Such evidence will be on official utility owner letterhead, signed by the utility owner granting such authority. Such written evidence shall acknowledge that the utility owner understands that the permit will only be issued to the owner.

2.2.2.4 The applicant shall submit reasonably necessary additional items of information, if any, as requested by the Department in conjunction with a permit application, including but not limited to: highway and utility plan and profile information, utility facility design, existing and/or proposed locations of other facilities within the affected area, evidence of adequate, and current liability insurance coverage of the proposed work, and any available Global Positioning System (GPS) coordinates for all proposed work.

2.2.3 Action on the Application; Issuance of Permit

2.2.3.1 The Department may refuse to accept or consider any incomplete application that lacks necessary information or detail. Such permit is not denied but the Department may defer the administration, review, and processing until it is deemed complete.

2.2.3.2 When a completed application is received, the Department shall promptly evaluate and act on the application in accordance with the Code and any applicable federal and state laws. For any applications involving extraordinary circumstances, the Department shall negotiate additional reasonable time, as necessary, to completely review and act on an application.

2.2.3.3 If the Department denies the permit requested by the application per Section 2.2.6.1, a copy of the permit application marked "Denied," together with a written explanation of the grounds for the denial shall immediately be provided. Retracted applications are not permit denials.

2.2.3.4 If the Department preliminarily approves the permit requested by the application, it will prepare and transmit to the applicant for signature a written permit containing standard provisions and applicable special provisions and other terms and conditions. The permit will be prepared using the Department's prescribed form. The permittee must sign and return the permit to the Department in a timely manner.

2.2.3.5 The Department may issue a "conditional" permit that is subject to further resolution of such matters as work schedule, construction methods or other permit requirements, before the affected work may proceed.

2.2.3.6 The effective date of the permit shall be the date the Department signs the permit. A permit shall not be effective or valid until it is signed by the permittee and the Department, with the date of issuance properly affixed thereto.

2.2.3.7 If the permittee does not sign the permit, or does not agree to all the terms and conditions of the permit, or does not return the signed permit within that 60-day period, then the Department shall have no obligation to sign the permit or to take further action on the permit.

2.2.3.8 The Department will submit the Utility Relocation Permit to the Utility Owner for signature when a utility relocation is required for a transportation project.

2.2.4 Utility Permits Requiring Third Party Approval

2.2.4.1 The applicant must obtain the approval of a third party, and agree to terms and all conditions imposed by that third party, before the Department will issue a permit in certain circumstances, which may include but not be limited to:

2.2.4.1.1 applications wherein the proposed accommodation is on federal lands and the SH ROW grant is for highway purposes only. In such cases, the applicant must first obtain permission from, and comply with the requirements of, the federal agency having jurisdiction over the underlying land; or

2.2.4.1.2 proposed utility accommodation wherein others hold an overlapping easement or other real property interest in a portion of SH ROW. In such cases, the application must include written evidence that the overlapping easement or other real property interest owner concurs with the application; or

2.2.4.1.3 required FHWA concurrence when the proposed accommodation is on the ROW of a federal aid highway and either:

2.2.4.1.3.1 does not conform with applicable federal regulations; or

2.2.3.1.3.2 does not comply with the Code; or

2.2.4.1.3.3 involves longitudinal use of the SH ROW by a private line as described in Section 3.2.2.5; or

2.2.4.1.4 the proposed accommodation involves the joint use of another utility owner facility or facilities, or involves the co-location of two or more utility facilities in a common trench or conduit.

2.2.4.2 Any necessary FHWA approval under Section 2.2.4.1 above will be requested by the Department during the permit application review process. The applicant shall be solely responsible to request and obtain all other approvals required under Section 2.2.4.1 above.

2.2.4.3 The applicant must identify and address the need for any such third party approval in the application. The Department will advise the applicant of such needs that it is aware of, and will make the permit expressly subject to prior written approval of such third parties, or may require reasonable evidence of such approvals.

2.2.4.4 If a permit is issued, it will contain, or incorporate by reference, all terms and conditions required by such third parties.

2.2.4.5 Environmental clearances must be obtained as described in Section 3.1.7.

2.2.5 Variance Procedures

2.2.5.1 The applicant must submit a written request, as part of the permit application, if seeking a variance from any requirement of the Code. The request shall describe the proposed variance, and the specific reasons for the variance.

2.2.5.2 In determining whether to grant a variance the Department will consider all relevant factors, including whether:

2.2.5.2.1 a variance is reasonably necessary for the convenience, safety and/or welfare of the public; or

2.2.5.2.2 there is exceptional or undue financial burden or other hardship on the applicant, or a physical impracticability; or

2.2.5.2.3 a variance will not impair the highway, highway operations, maintenance, safety or otherwise conflict with the purposes of the Code; or

2.2.5.2.4 a variance would not be detrimental to the public health, welfare and/or safety.

2.2.6 Denial, Suspension, Modification or Revocation of Permit

2.2.6.1 The Department may deny a permit pursuant to § 24-4-104, C.R.S. if the requested utility accommodation does not comply with the Code or applicable law, or otherwise endangers the public health, safety and/or welfare.

2.2.6.2 The Department may suspend, limit, modify, revoke or refuse to renew or revise a previously issued permit pursuant to § 24-4-104(5), C.R.S. if:

2.2.6.2.1 The application contains any material misrepresentations, false information, or its approval was otherwise obtained fraudulently and/or in bad faith; or

2.2.6.2.2 The permitted work is performed in violation of the terms and/or conditions of the permit, the requirements of the Code or any other applicable law; or

2.2.6.2.3 The Permittee fails to satisfactorily perform, in a timely manner, any obligation imposed by the permit or the Code; or

2.2.6.2.4 Such action is necessary to protect the highway facility, or otherwise protect the public health, safety and/or welfare; or

2.2.6.2.5 The Permittee is currently in default on the conditions of a previously issued permit or is currently in arrears on payment of damages to the Department, as specified under Section 2.1.2.3.

2.2.6.3 The utility permit manager shall give the Permittee notice in writing pursuant to § 24-4-104(3)(a), C.R.S., and afford the Permittee opportunity to submit a response and give the Permittee a reasonable opportunity to comply with all lawful requirements, except in cases of deliberate and willful violation or a substantial danger to public health and safety

2.2.6.4 Immediate Suspension of Permit. Pursuant to § 24-4-104(4)(a), C.R.S., where the utility permit manager has objective and reasonable grounds to believe and finds, upon a full investigation, that the Permittee has been guilty of deliberate and willful violation or that the public health, safety, or welfare imperatively requires emergency action and incorporates the findings in its order, the utility permit manager may summarily suspend the permit pending proceedings for suspension or revocation which shall be promptly instituted and determined. For purposes of immediately suspending a permit, full investigation means a reasonable ascertainment of the underlying facts on which the agency action is based.

2.2.6.5 Proceedings for Denial, Suspension, Modification or Revocation of Permit

2.2.6.5.1 Pursuant to § 24-4-104(3)(a), C.R.S., the utility permit manager shall give the applicant or Permittee:

2.2.6.5.1.1 Notice in writing that specifies in what respect the Applicant or Permittee has failed to comply with state and or federal law or these Rules;

2.2.6.5.1.2 If requested by the applicant or Permittee, a reasonable opportunity to comply with all lawful requirements; and

2.2.6.5.1.3 Notice of the right to request a hearing.

2.2.6.5.2 Pursuant to § 24-4-104(10), C.R.S., written notice of the denial, revocation, suspension, limitation, or modification of a permit and the grounds for the action shall be served promptly on the Permittee personally or by mailing by first-class mail to the last address furnished to the Department by the applicant or Permittee. The notice must also be sent on the same day via email to the applicant or Permittee's last known email address.

2.2.7 Hearings

2.2.7.1 The utility owner may request a hearing regarding the CDOT utility permit manager's decision respecting the renewal, denial, revocation, suspension, limitation or modification of a permit, pursuant to the provisions of § 24-4-104, C.R.S.

2.2.7.2 A request for hearing shall comply with the following provisions:

2.2.7.2.1 The request for an administrative hearing shall be submitted to the Chief Engineer within 60 days of receipt of personal service or first-class mail and email of written notice of denial or transmittal of the permit for signature. A request for a hearing shall be submitted to the Chief Engineer at the Colorado Department of Transportation.

2.2.7.2.2 Upon proper request by the utility owner, a hearing shall be held within ninety (90) days of the receipt of the request unless otherwise agreed upon.

2.2.7.3 Pursuant to § 24-4-105(2)(a), C.R.S., the Department shall give a Notice of Hearing to the utility owner of the time, place, and nature of the hearing, the legal authority and jurisdiction under which it is to be held, and the matters of fact and law asserted, at least 60 days prior to the hearing. The Notice of Hearing shall be served personally or by mailing by first-class mail to the last address provided to the Department.

2.2.7.4 The Chief Engineer shall appoint a Hearing Board consisting of three or more persons to preside over the hearing, at least one of which will have experience with utility issues within the SH ROW. Hearing Board members may serve on a Hearing Board more than once. The Chief Engineer shall select, from among the Hearing Board members, a chairperson who shall direct the proceedings, and shall assign a Department employee as a non-voting Hearing Board secretary, who will accomplish the Hearing Board's administrative duties.

2.2.7.4.1 The Hearing Board shall have authority and the hearing shall be conducted pursuant to § 24-4-105, C.R.S. Each side shall have 30 minutes in which to present their case, beginning with the utility owner, and the utility owner shall have 15 minutes in which to rebut the Department's presentation. The Hearing Board may opt to hear opening and closing statements, and may ask questions of either party. If requested, the Hearing Board may, but is not required to, extend the allotted times. Each party may have an attorney present their case, solely at their own expense. Any attorney who is a witness may not act as counsel for the party calling the attorney as a witness.

2.2.7.4.2 The Hearing Board shall electronically record the proceedings but must hold the hearing before a certified court reporter.

2.2.7.4.3 The utility shall have the burden of proof, by a preponderance of the evidence, relating to the Department's decision regarding the utility permit.

2.2.7.4.4 Within 10 days of the hearing, the Hearing Board shall make a recommendation to the Chief Engineer regarding the validity of the Department's action on the utility permit. The recommendation shall be in writing and contain a Statement of Findings and Conclusions upon all the material issues of fact, law or discretion presented by the record and shall enter an appropriate order sanctioning or denying relief. The recommendation shall not be binding on the Chief Engineer.

2.2.7.4.5 The Chief Engineer shall take the recommendation of the Hearing Board under advisement and shall make a final decision on the utility permit within 30 days of receipt of the recommendation. The decision of the Chief Engineer shall be in writing and sent to all parties via email and first class mail. The decision of the Chief Engineer shall be the final agency action of the Department pursuant to §§ 24-4-105 and 24-4-106, C.R.S.

2.2.7.4.6 Petitions for Declaratory Orders pursuant to § 24-4-105(11), C.R.S., may be considered by the Chief Engineer on any issues within the jurisdiction of the Commission and the Department.

2.3 Installation, Operation and Maintenance

2.3.1 Construction and Inspection

2.3.1.1 The permittee shall keep a copy of the completed utility permit, including accepted plans, accepted TCP, insurance and other required attachments at the accommodation work site at all times. All such documents and all the utility accommodation work shall be subject to Department review at all reasonable times.

2.3.1.2 Permittee shall not proceed with any work covered by a conditional permit pursuant to Section 2.2.3.5 without express written Department permission.

2.3.1.3 An approved permit will specify the completion date for all the accommodation work, which work shall include final cleanup. The permittee shall not perform any work after that date without the prior written Department approval. A permit shall expire automatically if the construction work approved therein has not commenced within the timeframe established in the permit or approved time extensions(s).

2.3.1.4 The permittee shall provide notice to the Department at the following times:

2.3.1.4.1 at least two working days prior to commencing work, or resuming operations which have been suspended for five or more consecutive working days; and

2.3.1.4.2 promptly upon completion of the work; or

2.3.1.4.3 when otherwise specified in the permit or as ordered by the Department.

2.3.1.5 The Department may designate an inspector during permit operations, to assist with coordinating the work and inspect the work during progress and upon completion.

2.3.1.6 The Department shall determine the extent of necessary inspection services.

2.3.1.7 Remediation of any unacceptable work under the approved permit shall be as ordered by the Department and completed in a timely manner prior to any further work, as determined by the Department.

2.3.1.8 The permittee shall attend a final site inspection, as directed by the Department.

2.3.1.9 The permittee shall comply with all requirements related to the performance of planned or ongoing highway construction work in the same area of the SH ROW, in order to coordinate the performance of any such work and minimize public inconvenience and cost.

2.3.1.10 When utility operations encounter areas of previously unknown historical or ecological significance, the permittee shall immediately avoid any further disturbance thereof, and shall promptly notify and follow any subsequent Department and/or other applicable Federal, State or local agency rules and regulations.

2.3.1.11 If utility operations cause or observe hazardous materials spills or unauthorized discharges, the permittee shall immediately notify the Department and any other interested Federal, State and local agencies. If the utility construction causes an unauthorized discharge that may potentially enter into the Department's Municipal Separate Storm Sewer System (MS4), operations must cease until the discharge has been properly contained and the appropriate corrective measures have been implemented. An unauthorized discharge is any discharge to a municipal separate storm sewer that is not composed entirely of stormwater, CDPS permitted discharges and allowable non-stormwater discharges.

2.3.1.12 If utility operations are not being carried out in compliance with the terms and conditions of the permit, the Department shall order the utility to perform whatever corrective measures are necessary to attain compliance. If there is an imminent danger to the public's health, safety or welfare, the Department shall order the utility to cease all operations, and if necessary, to remove all equipment and facilities from the SH ROW.

2.3.1.13 If no permit has been issued for utility work in the SH ROW, the Department shall order the utility to immediately cease all operations until such time as a permit is obtained. If deemed by the Department to be necessary for the public's health, safety or welfare, the Department shall order the utility to remove all equipment and/or facilities from the SH ROW. The permit issued for the work may include whatever terms and conditions necessary to correct any improperly performed work and attain Code compliance.

2.3.2 Plan Revisions or Altered Work

2.3.2.1 The permittee shall not revise the plans or methods of performing the work covered in the permit without prior written Department permission.

2.3.2.2 The permittee shall promptly notify the Department of any desired changes, or if site conditions are encountered which may require changes.

2.3.2.3 The Department may accept and/or order minor changes in the plans and/or methods that are within the scope of the existing permit.

2.3.2.4 The permittee must apply for, and receive a new or revised permit before performing any major change(s) in the work. Permittee will be required to provide the Department with "As-Constructed" plans when alterations are made as per Section 3.3.4.6 herein.

2.3.3 Operation and Maintenance

2.3.3.1 The permittee shall operate and maintain all utility facilities in SH ROW in accordance with the permit, either the initial permit or any subsequent individual or annual maintenance permit, and in a manner that does not impair traffic safety or unreasonably interfere with the operation and maintenance of the State highway or SH ROW.

2.3.3.2 A permit will describe the scope of work and conditions thereto, and of maintenance activities that may be performed without prior notice to and/or Department approval. The permittee shall provide written notice to, and if necessary obtain a new permit from, the Department before performing any maintenance not expressly covered in the permit.

2.3.3.3 The Department shall be given proper advance notice, as specified in the permit, whenever maintenance work will affect the movement and/or safety of traffic.

2.3.3.4 To determine if the permittee must obtain a new permit for maintenance activities, the Department shall consider all relevant factors, including: extent and duration of the work, traffic control requirements and required construction or excavation within SH ROW.

2.3.3.5 The permittee shall provide reasonable advance written notice before performing maintenance work which is confined to areas beyond the traveled way and contiguous shoulders, which does not require new excavation or construction, and which does not require the active control or rerouting of traffic, and temporary lane closures where utility facilities must be serviced from within the traveled way, provided that the traffic control plan in the original permit addresses such closures. Forty-eight (48) hours of notice is required for all non-emergency work requiring temporary lane closure(s).

2.3.3.6 Emergency repairs not affecting the movement or safety of traffic may be performed with reasonable notice to the Department as provided herein. The permittee shall notify the Department soon after the repairs are completed, and shall comply with the terms of the initial permit for the facility, as well as any subsequent permit issued to cover site restoration activities. If emergency repairs will affect the movement or safety of traffic, the permittee shall, before commencing such repairs, notify the Department and the appropriate law enforcement agency to coordinate traffic safety measures. The permittee shall notify the Department soon after the repairs are completed, and shall comply with the terms of the initial permit for the facility, as well as any subsequent permit issued to cover site restoration activities.

2.3.3.7 If the utility facility unreasonably interferes with or impairs any necessary highway function, the permittee shall, upon reasonable notice from the Department, shut off utility lines, remove combustible or hazardous materials from SH ROW, provide necessary temporary safeguards and take other appropriate actions as directed by the Department.

2.3.3.8 The permittee shall provide written notice to the Department and obtain written permission prior to any change in the carrying capacity of the utility's facility before implementing such change.

2.3.3.9 The permittee shall contact the Department immediately if, during any operation and maintenance procedure, an illicit discharge or improper connection is observed.

2.3.4 Safety Corrective Measures

2.3.4.1 The permittee shall promptly perform any corrective safety measures that the Department, after consultation with the utility owner and others, deems necessary to protect the public health, safety or welfare and has notified the permittee in writing thereof.

2.3.4.2 The permittee's performance of the safety corrective measures shall conform with the Code.

2.3.4.3 When the public health, safety or welfare require that any corrective measures be performed immediately, and if the permittee is unable or unwilling to take such action, the Department may perform those corrective measures, pending a determination of responsibility and an allocation of cost for that performance.

2.3.5 Utility Relocations Initiated by the Department

2.3.5.1 The utility shall relocate its existing facilities when the Department provides reasonable notice to the utility in writing that the relocation is necessary due to a transportation project or other transportation purpose. The notice shall include all available and relevant information including the Department's planned timeframe within which the utility relocation work must be completed. If the relocation of the company's facilities is necessitated by a transportation project, the Department shall provide written notice to the utility.

2.3.5.2 When the utility owner is required to relocate existing utility facilities, the utility owner shall assist the Department to develop schedules and alternatives concerning the new location of the facilities. The Department will consider the impact of new transportation projects on existing utilities during project development.

2.3.5.3 The utility shall relocate its facilities in compliance with all terms of the permit. The permit shall be prepared using the Department's prescribed forms.

2.3.5.4 The utility shall perform the relocation at or within a time convenient to, and in proper coordination with, the project or transportation-related activity, to minimize public inconvenience and cost, as directed by the Department.

2.3.5.5 Every permit shall be contingent upon and subject to the right of the Department to require the utility, upon reasonable written notice, to relocate facilities as necessary for any transportation purpose.

2.3.5.6 Relocations associated with Design-Build Contracts shall conform to the provisions of Part 14 of Article 1, Title 43, C.R.S.

2.3.5.7 Utility relocation cost responsibilities are described in Section 2.1.2.

2.3.6 Illegal or Nonconforming Installations or Activities

2.3.6.1 The utility owner shall, after receiving written notice from the Department: promptly remove any utility facility which was constructed, installed, revised or relocated without a utility permit or in violation of the terms of a permit after the effective date of the Code, immediately cease all unauthorized utility activities, promptly perform remedial actions to attain compliance with the terms and conditions of a permit that was issued after the effective date of the Code, and immediately suspend the permitted operation/maintenance of the facility when it is determined that the permittee has committed a deliberate and willful violation of the Code or permit and the public safety, health or welfare require emergency action.

2.3.6.2 Remedial actions, concerning utility accommodations that existed prior to the effective date of the Code, are subject to the provisions of Section 1.3.10.

2.3.7 Abandonment, Retirement, Change in Ownership

2.3.7.1 The utility shall notify the Department in writing of the planned inactivation of a facility or any portion thereof, including plans for removing the facility, or submit a request to retire or abandon the facility in-place.

2.3.7.2 The Department may allow a retired facility to remain in place. The retired facility shall remain the utility's sole responsibility, and is subject to all provisions of the Code and all terms and conditions of the permit issued for that facility, including maintenance and relocation requirements. The Department shall notify the utility in writing when the facilities may be retired in place, along with any applicable special conditions.

2.3.7.3 The utility shall promptly remove all abandoned facilities from the SH ROW and promptly restore the SH ROW to pre-existing or other conditions prescribed by the Department unless the Department in writing expressly allows the facility to remain in place. Written notice from the Department, allowing an abandoned facility to remain in place, may include special conditions.

2.3.7.4 In determining whether to allow abandoned or retired facilities to remain in place, the Department may consider such factors as: present or potential congestion of utility installations, highway construction and/or maintenance requirements, cost and/or difficulty of removal, presence of hazardous materials such as asbestos, the potential for the facilities removal by the Department at some future date, and traffic and/or safety requirements.

2.3.7.5 The Department will notify the utility in writing of the determination if and/or when the facilities must be removed.

2.3.7.6 If utility facilities are retired or abandoned in place, the Department may require the utility to: cap, plug or fill lines, furnish suitable location records for any such buried facilities, maintain records of such facilities and respond to locate notices and requests from the UNCC or others. In providing such services, the utility shall indicate to the requesting entity whether or not the subject facilities are retired or abandoned, perform any other actions as deemed necessary by the Department to protect the transportation facility or the traveling public.

2.3.7.7 When transferring ownership of utility facilities, both the original permittee and the new owner shall notify the Department in writing prior to the change, and such notice shall indicate the planned date of change. The notice from the new owner shall include a written statement accepting all terms and conditions of the existing permit, effective upon the planned date of ownership change.

2.3.7.8 Utility facilities containing asbestos shall not be retired in-place without the express written permission of the Department with the utility owner retaining full legal responsibility for the facilities.

3.0 ACCOMMODATION STANDARDS

3.1 General

3.1.1 Use of Highways for Non-Highway Purposes - Utilities may only be accommodated within SH ROW when such accommodations do not adversely affect highway or traffic safety, or otherwise impair the highway or its aesthetic quality, and do not conflict with the provisions of Federal, State, or local laws or regulations.

3.1.2 Utilities Which Serve a Highway Purpose

3.1.2.1 The applicability of the Code's location standards will be addressed in the service agreement.

3.1.2.2 The Department reserves the right to amend or waive Code requirements.

3.1.3 Joint Use Utility Facilities

3.1.3.1 Utilities shall implement joint use design alternatives where the Department determines it is necessary or prudent for the safe and efficient use of the SH ROW, especially in developing areas subject to a proliferation of individual utility installations. When so directed by the Department, the permittee is responsible for proper coordination with other affected utilities. Joint use facilities shall comply with all applicable industry guidelines and standards.

3.1.4 Utility Permit Standard and Special Provisions - Effect

3.1.4.1 Utility owner shall comply with all permit terms and conditions, including but not limited to, permit standard provisions, and any designated as special provisions.

3.1.5 Liability Insurance and Indemnification

3.1.5.1 The utility owner shall ensure that all permitted operations, whether performed by the utility owner or by subcontractors, are adequately and continuously covered by liability insurance. The types and minimum amounts of insurance acceptable to the Department will be specified in the permit application, and in the permit terms and conditions. It shall be the utility owner's responsibility to ensure full compliance with this requirement and failure to do so shall constitute a violation of the permit conditions and expose the utility owner to damage claims resulting from the subcontractor's operations within the SH ROW.

3.1.5.2 Policies shall name the Department, and the state of Colorado as an additional insured party, and provide for advance notification to both in the event of cancellation of coverage. This requirement is not applicable to other government entities.

3.1.5.3 Before commencing any work on any SH ROW, the utility owner shall furnish or cause to be furnished certificates of insurance in a form satisfactory to the Department certifying that the policies are in full force and effect. Insurance documentation shall be available on site at all times during the work.

3.1.5.4 Utilities that frequently operate within highway ROW may, with the Department's concurrence, annually or semi-annually file appropriate insurance documentation which demonstrates adequate and continual coverage of all permit operations.

3.1.5.5 To the extent authorized by the law, the utility shall hold harmless the Department, its employees and agents, against any action for personal injury or property damage caused by or growing out of any act or omission regarding the use or occupancy of SH ROW by the utility owner or by the utility's facilities.

3.1.6 Right of Way Considerations

3.1.6.1 In the location and design of its facilities, utility owners shall consider the need to conserve space for the future accommodation of other utility facilities, anticipate future expansion requirements and, when feasible, install additional carrying capacity to meet such needs. Utility owners shall enter into joint use arrangements with other utilities whenever feasible, and shall design facilities so as to minimize interference with the operation or maintenance of other pre-existing utility facilities.

3.1.6.2 The Department may deny a proposed utility use or occupancy of the SH ROW, based on highway user needs, safety or other criteria as set forth in 23 C.F.R. 645 B.

3.1.6.3 When the highway is adjacent to agricultural lands, the Department may deny a proposed utility use or occupancy of the SH ROW, but only when such denial is consistent with the provisions of 23 C.F.R. 645.211(c).

3.1.7 Environmental Compliance

3.1.7.1 The utility owner shall comply with the “Colorado Air Quality Control Act,” Title 25, Article 7, C.R.S., and regulations promulgated thereunder.

3.1.7.2 Utility operations shall comply with the maximum permissible noise levels and related requirements, prescribed in § 25-12-103, C.R.S.

3.1.7.3 The utility owner shall minimize the generation of hazardous wastes as defined in § 25-15-101(9), C.R.S. resulting from permitted operations, shall promptly remove any such wastes from SH ROW, and shall arrange for the proper treatment, storage, reuse, and/or disposal of such wastes in accordance with the provisions of Title 25, Article 15, C.R.S., and regulations promulgated thereunder.

3.1.7.4 As directed, the utility shall perform an appropriate environmental site assessment to determine whether a proposed buried installation would facilitate the underground migration of hazardous wastes from a known site and, if so, shall employ construction methods, as directed or accepted by the Department, to prevent such migration.

3.1.7.5 The utility shall comply with the “Colorado Water Quality Control Act,” Title 25, Article 8, C.R.S.; the “Protection of Fishing Streams,” Title 33, Article 5, C.R.S.; the “Clean Water Act,” with promulgated regulations and certifications issued. Temporary erosion and sediment control shall be provided in accordance with Sections 3.4.7 and 3.4.8.

3.1.7.6 The utility shall comply with all requirements of an applicable permit and all special conditions thereto, issued by the US Army Corps of Engineers, when placing dredged or fill materials in waters of the US for utility line crossings, intake or outfall structures.

3.1.7.7 When directed by the Department, the utility shall perform advance natural resources investigations in the vicinity of all proposed buried or above-ground installation, as necessary, to comply with the Endangered Species Act the Migratory Bird Treaty Act, and the Bald and Golden Eagle Protection Act. Additionally, the utility shall coordinate with the Department and the Colorado Division of Parks and Wildlife a minimum of 90 days in advance of construction within or adjacent to active stream channels in order to ensure compliance with § 33-5-101, C.R.S. The Permittee and the Department will share information whenever possible to assist in the compliance with this rule.

3.1.7.8 The utility shall avoid construction or other activity in wetlands unless there is no practicable alternative to such construction or activity and provided that all practicable measures are taken to minimize harm to wetlands which may result from such use. The utility shall perform any permitted work in wetlands in accordance with the Code, Federal, State or local rules and regulations, and as directed by the Department.

3.1.7.9 When directed by the Department, the utility shall perform advance cultural resources investigations, as necessary for the Department to comply with the "Colorado Historical, Prehistorical, and Archaeological Resources Act," § 24-80-401, C.R.S., and the "Colorado Register of Historical Places Act," § 24-80.1-101, C.R.S., which are incorporated by reference herein.

3.1.7.10 Any cultural resources investigation required by Section 3.1.7.9 above shall be performed by a historian qualified through the Secretary of the Interior or an archaeologist possessing a valid permit from the Colorado Office of Archaeology and Historic Preservation, as required. Such investigations, and proposed mitigation if any, shall be subject to review and concurrence by the Colorado State Historic Preservation Officer. Any permit issued shall include all mitigation measures prescribed as a result of such investigations.

3.1.7.11 When directed by the Department, the utility shall perform advance paleontological resources investigations in the vicinity of a proposed buried installation, as necessary for the Department to comply with the Colorado Historical, Prehistorical, and Archaeological Resources Act, Title 24, Article 80, C.R.S. Any paleontological resources investigation required shall be performed by a paleontologist permitted by the Colorado Office of Archaeology and Historic Preservation. Such investigations, and proposed mitigation if any, shall be subject to review and concurrence by the Department. Any permits shall include all mitigations prescribed as a result of such investigations.

3.1.7.12 For utilities that lie within any MS4 permit boundaries, the owner of such utility shall contact the state or local entities that have been issued an MS4 permit regarding stormwater-related compliance requirements under the entity's MS4 permit.

3.1.7.13 The utility shall comply with all applicable CDPHE water quality rules and regulations. The utility shall contact the CDPHE to obtain a CDPS permit, if required, for any type of discharge, including but not limited to the following: construction site stormwater runoff, stormwater from industrial sites, drainage from utility line casings, construction dewatering, hydrostatic testing water, equipment wash water or rinse operations water, effluent from industrial treatment plants, and effluent from municipal wastewater treatment facilities.

3.1.7.14 Prohibited non-storm water discharges that enter into the storm sewer system must be reported to the CDOT Water Quality Program Manager immediately upon discovery and repaired as soon as possible. Any spills which do not enter the storm sewer system shall be, at a minimum, referred to the Department.

3.1.7.15 The utility shall notify the Department of breaks or damage to any pipes owned by either the utility or by other entities, arising from the utility's permitted operations. The utility shall notify CDPHE if the break may lead to contaminated material or pollutants entering the Department's right of way and which may have the potential to reach State Waters. The utility shall be responsible for the prompt reconstruction and repair of damaged pipe, environmental cleanup, restoration and damages as required by the Department and CDPHE-WQCD, and any other regulatory agencies.

3.1.7.16 The utility shall perform concrete washout in accordance with approved Department guidelines, as explained in the Environmental Clearances Information Summary of the Permit.

3.1.7.17 Prohibited non-stormwater discharges include, but are not limited to, substances such as paint, automotive fluids, hydraulic fluids, solvents, oils or soaps.

3.1.7.18 The utility owner will comply with regulations established by the CDPHE, and/or policies established by the Department, pertaining to the handling and disposal of asbestos and asbestos-containing-materials, including applicable air quality permitting requirements, as explained in the Environmental Clearances Information Summary of the Permit.

3.1.7.19 If the utility owner is aware of the presence of mine tailings within the project site of a proposed facility installation, they shall so indicate on their permit application. If unexpected mine tailings are encountered during work, the utility shall immediately contact the Department. The utility owner shall comply with any special provisions pertaining to the handling, disposal, containment or monitoring of mine tailings as specified in their permit, or as directed by CDPHE or the Department.

3.1.7.20 It is the responsibility of utility owners to contact appropriate environmental regulatory agencies and obtain all environmental clearances and/or permits required for their activities. All required clearances or permits must be obtained prior to commencing work within the SH ROW. To the extent that the Department is made aware of any specific required environmental clearance or permit during the utility permit application review process, by either the permittee or the implementing environmental regulatory agency, the Department will include a special permit provision requiring that those specific clearances/permits be obtained prior to commencing work.

3.1.8 Aesthetic Considerations

3.1.8.1 Utility facility designs shall consider measures to preserve or enhance landscaping, vegetation, scenic and/or other aesthetic features of the highway and contiguous surroundings.

3.1.8.2 A utility installation shall not unreasonably detract from the scenic or aesthetic qualities inherent to the highway, and shall not block scenic views in any manner.

3.1.8.3 The utility shall utilize architectural considerations and colors that fit into the topography and blend with nature, as directed or approved by the Department.

3.1.8.4 New utility installations in scenic areas are subject to the criteria of Section 3.2.3 of the Code.

3.1.9 Closure Requirements

3.1.9.1 The submission of the As-Constructed plan shall meet all of the requirements set forth in Section 3.3.4.6.2 absent express approval to be excluded from the requirement to submit plans in the specified electronic file format.

3.1.9.2 The submission of the As-Constructed plan shall be accompanied by an email notification from the Utility requesting that the Permit be closed.

3.1.9.3 The Department shall accept or not accept the work under the Permit upon inspection.

3.1.9.4 When accepted, the Department shall issue a final acceptance of the work by letter.

3.1.9.5 Permittee shall be responsible for continued maintenance responsibilities pursuant to Section 3.4.8.8 for the elements of the highway facility impacted under the Permit until such time that the Department issues its final acceptance of the work pursuant to Section 3.1.9.

3.1.9.6 Final acceptance of the work shall begin the two-year warranty period and maintenance responsibilities pursuant to Section 3.4.8.8.

3.1.9.7 Failure to provide the Department with an "As-Constructed" plan when required as well as the Closure request will result in a delay of the final acceptance of the work.

3.1.9.8 Failure to provide the Department with an "As-Constructed" plan and the Closure request will:

3.1.9.8.1 Result in the delay other permit requests, see Section 2.1.2.3.2; and

3.1.9.8.2 Constitute a failure to perform an obligation imposed by the Permit or Code pursuant to Section 2.2.6.2.4.

3.2 Restricted Uses

3.2.1 New Above Ground Installations

3.2.1.1 New above ground utility installations on SH ROW shall be located as far as possible from the traveled way, preferably along the ROW line.

3.2.1.2 New above ground installations shall not be permitted within the clear zone, as determined in accordance with Section 3.3.3, unless the Department determines that undergrounding is unfeasible or unreasonably costly, and that no feasible alternatives exist. If permitted, the utility shall employ appropriate countermeasures to reduce hazards, as determined in accordance with Section 3.3.3.4.

3.2.1.3 Ground-mounted radio or telecommunication facilities including relay and repeater stations which must be housed in a building structure shall not be permitted on SH ROW unless the Department determines that feasible alternative locations are unavailable. The Department reserves the right to allow smaller, pole-mounted repeaters and telecommunications boosters within the highway right-of-way, subject to the same clear zone requirements applicable to other above-ground installations.

3.2.2 Accommodations on Expressway, Freeway and Interstate ROW

3.2.2.1 Utility accommodations within expressway, freeway and Interstate ROW shall be subject to additional requirements not generally applicable on other highways.

3.2.2.2 Utilities may be accommodated within frontage road areas of such ROW without complying with the requirements of this Section, if the frontage road areas can be accessed, for constructing and servicing the utility, from beyond the fully access controlled portion of that ROW. “Frontage road areas” will be delineated by a fence, access, or barrier line established between the frontage road and the expressway, freeway or Interstate mainline or ramps.

3.2.2.3 Except as provided in Section 3.2.2.6 below, utility accommodations within CDOT ROW shall comply with all applicable federal and state laws, local rules or regulations, and the requirements set forth in this Utility Code.

3.2.2.4 Utilities crossing freeway ROW, and all installations within or traversing interchange areas, shall conform with the requirements set forth by the FHWA, and with the following requirements:

3.2.2.4.1 Trenchless construction methods for buried line crossings shall be utilized for the full width between access lines, except that the Department may permit trenches within medians or beyond the outer roadway shoulders if it finds that other installation methods are impractical, and if adequate safeguards for workers and highway users are provided.

3.2.2.4.2 Pavement cuts shall not be permitted on freeways, expressways, or interstates, unless approved by the Department.

3.2.2.5 Except as provided in Section 3.2.2.6 below, new utilities shall not be permitted to be installed longitudinally within the access control lines of expressway, freeway, and Interstate ROW, unless special extenuating circumstances exist, as determined by the Department, and only under all of the following conditions:

3.2.2.5.1 The utility can be installed underground with minimal effort and disturbance, and will not require frequent maintenance.

3.2.2.5.2 The utility shall be installed along the outer edge of the ROW in a utility strip established by the Department.

3.2.2.5.3 Longitudinal utility installations shall not be permitted within the median.

3.2.2.6 Notwithstanding other provisions of this Section, and subject to the provisions of §§ 43-1-1201, C.R.S., et. seq., the "Public Private Initiatives Program," the Department's accommodation plan and the express approval of the Commission, and if it is on the interstate, also with the express approval of the FHWA, the Department may solicit and /or enter into agreement(s) with telecommunication provider(s) for the longitudinal installation of wireline and/or wireless telecommunication facilities within expressway, freeway or Interstate ROW.

3.2.2.7 Service connections to adjacent properties shall not be permitted from longitudinal utility installations located within the access control lines of an expressway, freeway, and interstate ROW. Service connections across the full width between access control lines may be permitted in areas where utility services are not available within reasonable distance along the side of the freeway where the service is needed.

3.2.2.8 Access for constructing and servicing utilities shall conform with permit conditions and the following Code requirements:

3.2.2.8.1 If access to or from the through roadways or connecting ramps is permitted, the permit must include provisions for vehicles to safely enter or leave the traveled way without impairing the flow of traffic. At interchange areas, such access shall be only from along lower-speed ramp sections.

3.2.2.8.2 Temporary lane closures may be permitted only when no other feasible alternative exists, and only as allowed by Region lane closure policy.

3.2.2.8.3 A locked gate along the freeway, expressway, and interstate fence may be permitted to meet periodic service access needs if the Department determines that other access alternatives are impractical and that the gate does not interfere with freeway, expressway, and interstate operations. If permitted, such gate shall be secure from unauthorized use and shall under no circumstance be utilized for direct access to or from the freeway, expressway, and interstate mainline or ramps. If a gate is to be located along the freeway, expressway, and interstate ROW line, the utility must also obtain and comply with the terms of a temporary access crossing license issued by the Department pursuant to § 43-2-147, C.R.S.

3.2.2.9 The utility shall not access any area within freeway, expressway, and interstate ROW without prior notification and written approval of the Department.

3.2.3 New Installations Within or Adjacent to Scenic and Historic Areas and Byways

3.2.3.1 A new utility installation on a highway, or on land acquired or improved with highway funds, which is located within or adjacent to areas of scenic enhancement or natural beauty, may be permitted. Such installation shall not require extensive removal or alteration of trees or other natural features visible to the highway user or impair the visual quality of lands being traversed. For a proposed new aerial installation, the Department must find that other locations are not available or are unusually difficult and costly, are less desirable from the standpoint of aesthetic quality, that undergrounding is not feasible or is unreasonably costly, and that the proposed installations will be made at a location and employ suitable designs and materials which give the greatest weight to the aesthetic qualities of the area to be covered.

3.2.3.2 Areas of scenic enhancement or natural beauty may include but are not limited to scenic strips, overlooks, rest areas, landscaped areas, public park and recreation lands, wildlife and waterfowl refuges, native roadside trees, and historic districts and sites.

3.2.4 Private Lines

3.2.4.1 Private line crossings of SH ROW may be permitted, subject to the same location and design requirements of the Code applicable to utility line crossings.

3.2.4.2 Longitudinal installations of private lines shall be subject to a determination by the Department and the FHWA that the proposed accommodation is in the public interest and will not impair the highway or interfere with the free and safe flow of traffic thereon.

3.2.4.3 For private crossings, shut-offs may be required adjacent to the ROW in case of emergency. Private line owners shall have markers on the shut-offs with an emergency contact number.

3.2.4.4 For maintenance work on line crossings or longitudinal installations of private lines, the private line owner shall obtain a permit from the Department.

3.3 Location and Design Requirements

3.3.1 General Location Requirements

3.3.1.1 The utility shall locate all facilities in accordance with the horizontal and vertical clearance requirements set forth in the Code.

3.3.1.2 The utility shall locate longitudinal installations on a reasonably uniform alignment as near as practical to the SH ROW line. Except as otherwise provided in Sections 3.3.1.3 and 3.3.1.4 below, the utility shall not locate longitudinal installations within median areas, traveled ways, shoulders, or under curbs or sidewalks.

3.3.1.3 Except as provided in Section 3.3.1.4 below, the utility shall locate a buried longitudinal installation not less than 15 feet beyond the edge of pavement or back of curb to avoid potential conflict with highway signs, guardrail, or other appurtenances. If there is no feasible alternative to longitudinal placement outside of this 15 foot zone, the Department may, as a condition of approval, specify from among the following safeguards: increased cover depth to 60 inches in lieu of additional mechanical protection, require a concrete cap, Class B or better, with a minimum 4 inches thickness, the full width of the installation trench, require concrete encasement, Class B or better, minimum 2 inches on all sides, or require encasement in 0.25 inch wall thickness steel conduit, or other acceptable material.

3.3.1.4 The Department may allow longitudinal placement of buried utility lines beneath present and planned median areas, traveled ways, shoulders, or under curbs or sidewalks, when the State highway is also part of a local street system, subject to municipal regulations, and/or when the State highway is within an urban area as defined by the Code.

3.3.1.5 Where utility facilities are permitted to cross the highway, the utility shall install the facilities on a line perpendicular to the highway alignment.

3.3.1.6 The utility owner shall not install underground facilities in the following locations: in deep cuts, ditch flow lines, near footings of bridges and retaining walls, across intersections at grade or ramp terminals, at cross drains where flow of water, drift or stream bed may be obstructed, or within basins drained by a pump in wet or rocky terrain and difficult to attain minimum cover.

3.3.2 General Design Requirements

3.3.2.1 The utility owner shall be responsible for the design of all utility facilities to be installed within SH ROW, subject to the provisions of the Code.

3.3.2.2 The utility shall design its facilities to avoid unreasonable conflict with planned or programmed changes to existing highway facilities, as directed by the Department, so as to avoid such conflict.

3.3.2.3 The utility facility shall be of durable materials in conformity with accepted practice or industry standards, designed for long service life and relatively free from routine servicing or maintenance.

3.3.2.4 The utility shall design all utility installations to, at a minimum, meet the following requirements as applicable: electric power or communication facilities shall conform with all applicable Federal, State, and local jurisdiction codes, pipelines shall conform with the applicable provisions of industry standards and Federal and State rules and regulations, liquid petroleum pipelines shall conform with the recommended practice of the American Petroleum Institute for pipelines crossing under highways and railroads, pipelines carrying natural or other gas shall conform to the rules and regulations of the US Department of Transportation, Title 49, C.F.R., Part 192 which is incorporated herein by reference, and any pipeline carrying hazardous liquids shall conform to the rules and regulations of the US Department of Transportation governing the transportation of such materials, Title 49, C.F.R., Part 195, which is incorporated herein by reference.

3.3.2.5 The utility owner shall design and construct all buried facilities, including pipelines, conduits and casings to withstand the full range of expected internal and external pressures and loads, including internal pressures ranging from maximum expected pressure to zero pressure, and external loads from the highway and superimposed vehicle loads. Pipelines shall also be designed and constructed to resist internal and external corrosion.

3.3.2.6 All new utility facilities shall be free of asbestos and asbestos containing materials.

3.3.2.7 The utility shall design and construct all utility facilities in conformance with the applicable provisions of all Federal and State laws. The utility also has the responsibility to determine whether any local jurisdiction codes apply.

3.3.3 Clear Zone Requirements

3.3.3.1 The utility shall maintain a clear zone in accordance with the AASHTO Roadside Design Guidelines unless otherwise permitted by the Department.

3.3.3.2 The utility shall not keep, store, stockpile or allow to remain, either in the traveled way or in the clear zone of SH ROW, any utility accommodation work equipment, material or excavation or any other nontraversable hazard or fixed object.

3.3.3.3 The clear zone shall be as follows:

3.3.3.3.1 In urban areas with barrier or vertical curbs and design speeds of 40 MPH or less, a clear zone of fifteen (15) feet shall be provided wherever feasible. Where fifteen (15) feet cannot be provided, the clear zone shall extend beyond any adjacent sidewalks. In variance situations, the clear zone shall be not less than 2 feet beyond the front face of the curb for frangible objects and not less than 4' beyond the front face of curb for rigid objects. Placement of utility related appurtenances shall likewise take into consideration the ADA lateral offset requirements for handicap accessibility which requires a minimum unobstructed sidewalk width of 48".

3.3.3.3.2 In all areas without curbs, or with mountable curbs, and with design speeds of 40 MPH or less, a minimum clear zone of fifteen (15) feet shall be provided, unless otherwise permitted by the Department.

3.3.3.3.3 In all areas with design speeds of 45 MPH or greater, the AASHTO "Roadside Design Guide" shall be used to determine clear zone width.

3.3.3.4 If the Department determines, in accordance with Section 3.2.1.2, that a new above ground installation may be permitted within the clear zone, the utility shall provide countermeasures as directed by the Department in the permit. Countermeasures may include: installation in locations which minimize exposure to out-of-control vehicles, use of breakaway features, use of impact attenuation devices, and use of delineation and/or shielding. High crash and/or high risk spot locations of fixed utility appurtenances within the clear zone shall not be permitted, such as along ditch flow lines and turning radii of intersecting roads or along the outside edge of horizontal curves.

3.3.3.5 The location and design of traffic barriers and countermeasures shall comply with the AASHTO "Roadside Design Guide" as well as the Manual for Assessing Safety Hardware (MASH).

3.3.3.6 All excavations shall be closed at the end of daily operations, and no unattended open excavation will be allowed within the clear zone after dark, unless otherwise permitted by the Department.

3.3.4 Utility Plans

3.3.4.1 Along with a completed utility permit application and other associated documents, the utility shall submit detailed plans or detailed work sketch showing the location, character, dimensions and details of proposed construction. See 3.3.4.6 below.

3.3.4.2 Any permit shall be subject to utility owner's compliance with the plans accepted by the Department.

3.3.4.3 A Boring permit application shall include plan and profile information at the request of the Department, which may include vertical and horizontal offsets to all existing utilities, ROW line, and face of curb.

3.3.4.4 The Department may issue a conditional permit if certain details of the plans must be completed after permit work starts, but the utility shall not start any work related to such details until accepted by the Department.

3.3.4.5 After a permit is issued, all plan revisions shall conform with Section 2.3.2.3.3.4.6 Required Documentation.

3.3.4.6.1 Record Set. When the engineering design requires the oversight of a licensed professional engineer, a sealed Record Set is required to be submitted to CDOT prior to the start of construction. The Architects, Professional Engineers, and Professional Land Surveyors Rules and Regulations, 4 CCR 730-1, govern the sealing requirements of engineering documents.

3.3.4.6.2 As-Constructed Plan. The Department shall require the utility to submit “As-Constructed” plans within forty-five (45) days of completion of the work, which shows actual final surface and subsurface utilities, including location, alignment, profile, and depth. Such plans shall be of an electronic format compatible with Department software. The plans shall be in electronic PDF file format, 300 dpi, page aligned, searchable, compressed, and compliant with ISO PDF/A-1b or 1a. Additionally, geodetic datum of each structure shall be provided and include the depth of underground utilities, as specified in the Special Provisions of each Permit. Exceptions to this electronic submission requirement must be agreed upon by the Department in writing.

3.3.4.6.3 Survey Utility Plan Set. CDOT may require Survey Plans (as that term is defined above) for utility work.

3.3.5 Aerial and Ground-Mounted Electric and Communications Facilities

3.3.5.1 The utility shall locate, where feasible, poles, guys, anchors, and related ground-mounted appurtenances near the ROW line and beyond embankment slopes. The utility shall not locate guy wires and stub poles between a pole and the traveled way where either guy wires or stub poles encroach upon the clear zone.

3.3.5.2 Aerial longitudinal installations in SH ROW shall be limited to single pole construction. The Department shall not permit duplication of pole line construction on the same side of the highway. The utility must arrange for the joint use of single pole construction for aerial longitudinal locations where two or more utilities must utilize aerial facilities on the same side of the highway.

3.3.5.3 The Department shall review and accept utility plans with respect to location, the manner in which the utility facility is to be installed, measures taken to preserve safe and free flow of traffic, structural integrity of the roadway, highway structure or appurtenance, aesthetic quality of the highway, ease of maintenance, future roadway expansion, and integrity of the utility facility.

3.3.5.4 The vertical clearance for overhead power and communication lines above the highway, structure or ROW surface, and the lateral and vertical clearance from bridges shall conform with the clearances as shown below in Table 1.

3.3.5.5 The utility shall install overhead wires, conductors, and cables above the ROW surface in compliance with industry standards and Federal and State requirements referenced herein. The utility must also determine whether any local jurisdiction codes may apply at the time of design or installation.

3.3.5.6 The minimum overhead clearance shall apply to conductors at maximum final sag conditions with specified thickness of ice at 32°F (no wind displacement), at 120°F (no wind displacement), or maximum conductor temperature for which the line was designed to operate, whichever produces the largest final sag. Additionally, the minimum overhead clearance must be maintained at the point where the conductor is nearest the roadway or ground surface, taking both sag of the line and variations in ground surface elevation into account. The minimum vertical clearances between the conductor and the structure, bridge, roadway or ground surface within the ROW shall be as listed in Table 1.

TABLE 1

Minimum Vertical Clearance Within Right-of-Way

Type of Conductor, Cable & Voltage	Over Roadway Template	Outside Roadway Template
Insulated communication conductors & cables; messengers; grounded or effectively insulated guys; effectively grounded neutral conductors; 230C1 supply cables.	24 ft.	20 ft.
Noninsulated communication conductors; supply cables 0-750 Volts (multiplex wire)	24 ft.	20.5 ft.
Open Supply Conductors 0 - 750 Volts	24 ft.	21 ft.
Open Supply Conductors >750 Volts to 22 kVolts	25 ft.	23 ft.
Voltages exceeding 22 kVolts to 50 kVolts	25 ft.*	23 ft.*
Voltages exceeding 50 kVolts	25.5 ft.**	23 ft.**

* plus 0.4 inch per 1,000 Volts in excess of 22 kVolts

** plus [0.4 inch per 1,000 Volts in excess of 22 kVolts] X [1.0 + (.03 per 1,000 feet above 3,300 feet above sea level)] or alternate method for voltages exceeding 98 kVolts

Voltages are phase to ground for effectively grounded circuits and those other circuits where all ground faults are cleared by promptly de-energizing the faulted section, both initially and following subsequent breaker operations

3.3.5.7 The utility may locate ground-mounted components of aerial facilities crossing the highway in highway median areas beyond the clear zone for both directions of travel with Department approval.

3.3.6 Underground Electric and Communications Facilities

3.3.6.1 The utility shall place buried facilities in conduit at a cover depth of a minimum of 48 inches or as otherwise directed by the Department.

3.3.6.2 Where the Department reasonably anticipates the utility will need to expand its future line capacity along the same alignment as the permitted facilities, the utility shall place spare conduit or duct, when directed in the permit, to accommodate such future needs and to avoid possible future disturbance to the highway or to traffic.

3.3.6.3 The utility shall locate pedestals, or other ground mounted appurtenances to a buried facility as near as practicable to the ROW line or any applicable clear zone requirements.

3.3.6.4 If the Department approves a variance for less than the minimum cover depth specified in Section 3.3.6.1 above, the utility shall provide sufficient protective measures to include encasement, capping, or sleeving of the facilities as provided in 3.3.11.

3.3.7 Water, Sanitary Sewer, Natural Gas, and Hydrocarbon Pipeline Facilities

3.3.7.1 The utility shall install pipeline facilities at not less than the following minimum depths of cover:

3.3.7.1.1 water and sanitary sewer pipelines—4 feet 6 inches or the local frost penetration depth, whichever is greater, or as directed by the Department in the permit; and

3.3.7.1.2 natural gas transmission lines, mains, and service lines, and liquid hydrocarbon pipelines—48 inches, or as directed by the Department in the permit.

3.3.7.2 The utility shall reroute, or protect the pipeline, as determined by the Department in accordance with Section 3.3.11, where less than the minimum cover described above is available for any reason, including conflict with other utilities, water table, or local codes.

3.3.7.3 Joints in all pipelines operating under pressure shall be of mechanical or welded, or other leak-proof type of construction. The utility shall not use mortar, grout, or other Portland cement materials as pipeline joint sealants.

3.3.7.4 The utility shall construct sanitary sewers of materials and install them in a manner that will minimize the potential for any leakage. Such sewer lines shall be located below and at a minimum of ten (10) feet horizontal separation between pipes from all water lines and storm sewer lines. Where sanitary sewers are located such that any leakage that might occur could reach surface waters, the utility shall establish a schedule for routine inspection of the sewer line. Any observed leaks from sanitary sewers within the SH ROW shall be reported to the CDOT Water Quality Manager and the Department immediately upon discovery and repaired as soon as possible.

3.3.7.5 Sanitary sewers larger than 24 inches, lift stations, and other certain wastewater treatment facilities are subject to the design criteria, design review and approval of the CDPHE-WQCD. Other Federal, State and local jurisdiction codes may also apply.

3.3.7.6 Potable water treatment facilities and certain related distribution system facilities are subject to the design criteria, design review and approval of the WQCD. Other Federal, State and local jurisdiction codes may also apply.

3.3.7.7 Thrust blocks or mechanical joint restraints shall be required on all vertical and horizontal bends in pressure pipes.

3.3.8 Irrigation and Drainage Pipes, Ditches, Canals, Gravity-Fed Systems, and Stormwater Drainage Facilities

3.3.8.1 Irrigation and drainage pipelines shall meet the applicable requirements of Section 3.3.7. The utility shall locate Gravity-Fed Systems, open ditches, and canals in conformance with the requirements of Sections 3.2.1 and 3.3.3 for above ground utility accommodations.

3.3.8.2 Irrigation facilities shall be constructed as directed by the Department.

3.3.8.3 Drainage pipelines carrying any type of wastewater effluent must be approved and receive a CDPS permit from the CDPHE-WQCD.

3.3.8.4 Stormwater Drainage Facilities: The Code's definition of "utility" includes "storm water not connected with highway drainage." Stormwater facilities constructed within the SH ROW which carry stormwater originating outside of the SH ROW and pass through the SH ROW without any connection to highway drainage are subject to the provisions of the Code, including all permitting requirements.

3.3.8.5 When a Department utility permit must be obtained to install or perform maintenance on storm drainage facilities, the design and construction of such facilities shall conform to Department standards and specifications. All plans must be accepted by the Department. Detailed design or construction requirements may be specified in the utility permit.

3.3.8.6 Stormwater originating outside of the SH ROW which flows into the SH ROW and mixes with highway drainage is not a utility under the Code.

3.3.8.7 Connections of other stormwater drainage systems to the Department highway drainage system shall be approved by the Department. A utility special use permit shall be required for the construction or maintenance of such facilities.

3.3.9 Highway Lighting Facilities

3.3.9.1 Highway lighting facilities shall be designed in accordance with current standards, as directed by the Department.

3.3.9.2 When operation and/or maintenance responsibilities for proposed SH ROW lighting will rest with a utility or local agency pursuant to law or agreement, the lighting facility shall be compatible with that entity's system and inventories.

3.3.10 Highway Structure Attachments

3.3.10.1 Utility facilities shall not be attached to highway structures, including but not limited to bridges, culverts, lighting supports, traffic signal poles, sign supports, or sign bridges without Department approval. Gas lines, sewer lines, or waterline connections, such as valves, shall not be allowed inside of box girders, tub girders, or within the concrete for concrete box culverts.

3.3.10.2 The utility shall design the proposed structure attachment individually for a specific highway structure. The Department's Staff Bridge permission shall be required for all attachments to all bridges and structures in the SH ROW. Any attachment or modification shall not diminish the structural capacity or integrity of the structure. Attachments shall not inhibit the ability to inspect the bridge or its components.

3.3.10.3 The utility shall locate the entire utility installation on a highway bridge or structure so as to not reduce the vertical or horizontal clearance otherwise available between the bridge or structure and any stream, pavement or rails. On water crossings by means of a bridge attachment, the utility line shall be no lower than the bottom of a stringer, and shall be located on the downstream side.

3.3.10.4 The utility shall insulate, ground, and carry communication and electric power line attachments in protective conduit or pipe from below the point of ground exit to below the point of ground re-entry. Carrier pipe and casing pipe shall be insulated from electric power lines.

3.3.10.5 Structure attachments shall conform with applicable protection requirements of Section 3.3.11.

3.3.11 Encasement and Related Protection of Utility Lines

3.3.11.1 The utility shall protect buried utility lines and structure attachments, as follows:

3.3.11.1.1 Buried facilities which are subject to damage from construction or maintenance operations, as determined by the Department, may require additional protective measures, such as: a concrete cap, Class B or better, minimum 4 inches thickness, the full width of the installation trench; concrete encasement, Class B or better, minimum 2 inches on all sides; sleeving in 0.25 inch wall thickness steel conduit, or other acceptable material; and/or a tunnel or gallery.

3.3.11.1.2 Where metal pipelines are installed in a corrosive environment and encasement is not employed, the utility shall demonstrate that the welded steel carrier pipe will provide sufficient strength to withstand the internal design pressure and the dead and live loads of the pavement structure and traffic. Additional protective measures shall include: heavier wall thickness, higher factor of safety in design, or both, adequate coating and wrapping in accordance with industry standards, cathodic protection, and the use of Barlow’s formula regarding maximum allowable operating pressure and wall thickness as specified in 49 C.F.R. Part 192.105. Corrosion protection shall be required for all steel carrier pipes. Cathodic protection shall be mandatory for natural gas and hazardous material pipelines in accordance with 49 C.F.R. Parts 192 and 195.

3.3.11.1.3 At locations subject to settlement or displacement, including but not limited to: areas of unstable ground, near highway structure footings, where the method of installation or use of flexible pipe may result in subsidence or reduced pavement support, a cradle or wall, casing pipe, concrete encasement, extra strength or heavy wall thickness pipe, or leak-proof construction shall be required.

3.3.11.1.4 Where water, high-pressure gas, or hazardous material pipelines are either in or suspended from a highway structure, a casing pipe may be required.

3.3.11.2 The utility shall utilize casing pipe when necessary to facilitate bored or jacked installations, to protect coated carrier pipes from damage during insertion, as a means of conveying leaking fluids or gases to points safely beyond the traveled way, when necessary to provide for the future adjustment, removal or replacement of the carrier line, or unless otherwise directed by the Department.

3.3.11.3 Where a casing is required and the use of a metal casing could defeat the cathodic protection circuit applied to a carrier pipe, the utility shall take the protective measures determined by the Department to be appropriate in the circumstances, including: use of non-metallic casings, or use of carrier/ casing insulation systems, or cathodically protecting casing and carrier pipes as a unit.

3.3.11.4 The utility shall use tunnels or galleries when determined by the Department to be appropriate, such as where several utility lines must share a crossing location, as a provision for future increase in line size or additional lines, or as a means of inspecting carrier lines in the crossing.

3.3.11.5 On highway crossing installations, the utility shall extend any required protection at a minimum: beyond slope and ditch lines on uncurbed sections, or beyond the outer curbs on curbed sections or the full width between access control lines on expressways, freeways and Interstates. For installations other than crossings, the utility shall extend the protection as specified by the Department.

3.3.12 Vents, Drains, Manholes, Valves and Appurtenances

3.3.12.1 The utility shall locate vents at the high end of casings that are less than one hundred and fifty (150) feet long. The utility shall locate vents at both ends of casings that are longer than one hundred and fifty (150) feet. The utility shall locate vent standpipes at a fence line or ROW line.

3.3.12.2 The utility shall provide drains for casings, tunnels, or galleries which enclose carriers of liquid, liquefied gas, or heavy gas. Drains for allowable non-stormwater discharges may outfall into roadside ditches or natural watercourses at locations approved by the Department, and as allowed by the CDPHE-WQCD. At outfalls for unallowable non-stormwater drains, the utility shall take all additional measures that are determined by the Department and the CDPHE-WQCD to be suitable to protect against possible soil and/or water contamination, such as construction of dikes or liner installation. Outfalls shall not be used as a wasteway for purging the carrier.

3.3.12.3 The utility shall not locate manholes in the present or planned traveled way or shoulder areas, except:

3.3.12.3.1 in municipal streets, provided that manholes shall not be located at street intersections nor in the wheel paths of traffic lanes; and

3.3.12.3.2 where manholes are essential parts of existing lines.

3.3.12.4 The utility shall install shutoff valves on pressurized or hazardous materials pipelines at the following locations:

3.3.12.4.1 near the ends of highway structures to which such lines are attached, unless the pipeline is equipped with nearby shutoff valves or operates under effective control by automatic devices; and

3.3.12.4.2 near unusual hazards, such as unstable ground, structure footings, or locations subject to disturbance by construction and/or maintenance operations, unless the affected line segment can be isolated by other sectionalizing devices within a reasonable distance.

3.3.12.5 The utility shall install permitted structural elements, such as manholes, vaults or anchor blocks, so that the high point of the element is at or below the grade of the traveled way or shoulder surface. Manhole covers located in the traveled way or shoulder shall be not less than one-quarter inch, or more than one-half inch, below the finished pavement grade.

3.3.12.6 Meters shall not be placed on SH ROW except within local jurisdiction where any local jurisdiction codes may require such use.

3.4 Construction Requirements

3.4.1 Access for Constructing or Servicing Utility Facilities

3.4.1.1 The utility shall access the work site only at locations and by means acceptable to the Department.

3.4.1.2 The utility shall not work at night or on Saturdays, Sundays, or holidays, except as approved by the Department. The Department may specify and/or restrict the utility's access to construct or service utility facilities in accordance with each region's lane closure policy, during peak traffic flow or due to adverse weather, insufficient visibility, or other conditions not conducive to safe and efficient traffic operations.

3.4.1.3 To gain access to the SH ROW from abutting properties at other than established, approved locations, the utility must obtain and comply with the terms of an access permit issued pursuant to § 43-2-147, C.R.S.

3.4.2 Traffic Control and Work Zone Safety Requirements

3.4.2.1 The utility shall develop and submit a TCP to the Department for any work that will affect traffic movement or safety. The utility shall implement the TCP and utilize traffic control devices to ensure the safe and expeditious movement of traffic around and through the work zone and the safety of the utility work force.

3.4.2.2 The utility shall develop the TCP, and MHT in conformance with Department standards. The TCP shall include provisions for the passage of emergency vehicles through the work zone, and shall conform to all Federal, State and local agency rules and regulations. The TCP and MHT shall contain sufficient detail to demonstrate conformity with all applicable requirements.

3.4.2.3 At CDOT's direction, the utility shall have a TCS at the work site at all times in direct responsible charge of implementing the TCP. If the scope of the utility project necessitates a flagger, the utility shall have the appropriate number of certified flaggers at the work site in accordance with the TCP.

3.4.2.4 The utility shall not start the permitted work before the Department accepts the TCP.

3.4.2.5 The Department may review and order changes to the TCP and MHT during performance of the work, as required.

3.4.2.6 The utility shall comply with the TCP at all times during performance of the work.

3.4.2.7 The utility shall maintain the TCP at the work site at all times during performance of the work, and make available to the Department upon request.

3.4.2.8 The TCP shall ensure that closure of intersecting streets, road approaches and other access points is minimized. On heavily traveled highways, the Department shall not permit utility operations that interfere with traffic during periods of peak traffic flow.

3.4.2.9 When utility operations coincide with highway construction or maintenance operations or other permitted activities, the utility shall develop and implement the TCP in cooperation and coordination with the highway agency and/or its contractors, and as otherwise directed by the Department in the permit.

3.4.2.10 All flaggers shall have a current CDOT flagger certification card, and shall be capable of effectively communicating with the traveling public and others at the work site.

3.4.2.11 All utility employees working within the SH ROW shall comply with any applicable OSHA regulations.

3.4.2.12 Personal protective equipment (e.g. head protection, footwear, high visibility apparel, safety glasses, hearing protection, respirators, gloves, etc.) shall be worn as appropriate for the work being performed, and as specified in all applicable Federal, State and local rules and regulations.

3.4.3 Utility Owner Notification

3.4.3.1 The utility will comply with the applicable requirements of Article 1.5 of Title 9, C.R.S., including any requirement to participate in the State's Notification Association pursuant to § 9-1.5-105, C.R.S. All owners of underground utilities within the SH ROW must become members of the UNCC.

3.4.3.2 Pursuant to § 9-1.5-103, C.R.S., and except as provided for emergency or other special circumstances in that statute, the permittee shall not make or begin excavation without first notifying the UNCC. The Department shall be notified of planned excavation as specified in the permit. If known by the utility permittee to exist, underground utility owners who have not yet become members of the UNCC shall be contacted directly. Notice of commencement, extent, and duration of the excavation work shall be given at least two business days prior thereto, not including the day of actual notice.

3.4.4 Pavement Cuts and Repairs

3.4.4.1 The utility shall install buried facilities crossing the highway only by trenchless methods, except as provided by this Section.

3.4.4.2 The utility may install buried facilities by open cut of the pavement structure only if it demonstrates to the Department that: trenchless methods are not feasible due to soil conditions, or space limitations or other considerations preclude trenchless construction, and/or removal and replacement of the pavement structure will be concurrent with or closely precede a project to construct or reconstruct the affected roadway.

3.4.4.3 When the Department permits pavement cuts, the utility shall comply with the following conditions: no more than half the width of the roadbed may be opened at any time, the utility must replace any removed pavement to a design equal to or greater than the surrounding, undisturbed pavement structure, and the utility must saw or wheel-cut to a neat line, or as otherwise specified in the permit, any pavement removed. On trenched installations, unless otherwise specified by the Department, the utility shall implement additional cutback of base and surfacing to a minimum of 2 feet beyond normal trench limits, replace excavated portions of the base and subgrade with flowable backfill, trim all overbreaks or incidental damage of existing pavement back to a neat line before patching, repair all surface gouges or other minor damage, and restore all pre-existing pavement markings in and adjacent to resurfaced areas.

3.4.5 Trenched Construction and Backfill

3.4.5.1 The utility shall construct vertical-sided trenches, of uniform width, and no wider than the line diameter plus three feet, unless the utility demonstrates to the Department's satisfaction that such construction is impracticable.

3.4.5.2 Shoring or bulkheading shall conform with all applicable Federal, State and local jurisdiction construction and safety standards.

3.4.5.3 The utility shall provide drainage from excavation areas.

3.4.5.4 The utility shall not perform construction or compaction by means of jetting, puddling, or water flooding within SH ROW; however, a limited amount of puddling may be allowed up to the springline of the pipe when free-flowing granular backfill materials are used, when necessary to obtain proper compaction of pipeline bedding.

3.4.5.5 Unless otherwise directed or approved by the Department, the utility shall replace excavated material with flowable backfill as specified by the Department within toes of slopes or place backfill in 6 inch layers, each consolidated by mechanical tamping and controlled addition of moisture to a density equal to or greater than that of the surrounding undisturbed soil outside toes of slopes.

3.4.6 Trenchless Installations

3.4.6.1 Portal limits of trenchless crossings shall be established safely beyond the highway surface and clear zone, and in no case shall the lateral distance from the surfaced area of the highway to the boring or jacking pit be less than the vertical difference in elevation between such surface and the bottom of the pit.

3.4.6.2 Shoring or bulkheading shall conform with applicable Federal, State and local jurisdiction construction and safety standards.

3.4.6.3 The utility shall not use water jetting or tunneling, but water-assisted or wet boring may be permitted if determined by the Department to not result in excessive erosion or unacceptable moisture conditions in the roadway subgrade.

3.4.6.4 The boring hole shall be oversized to the minimum amount required to allow pull-through of the conduit being installed, based upon equipment and product manufacturer's specifications. If the oversize excavation is not already filled by the drilling slurry after product pull through, the void shall be grouted to the satisfaction of the Department. Grout or other approved backfill material shall be used for pipe of 12 inches or more in diameter, and for overbreaks, unused holes or abandoned pipe. The composition of the grout shall be a cement mortar, a slurry of fine sand or fine granular materials, subject to Department approval.

3.4.6.5 The utility shall follow any applicable manufacturer's guidelines and industry standards for equipment set-up and operation. The utility shall assess soil conditions to determine the most appropriate installation technique. Underground borepaths or tunnels shall be tracked and recorded by the utility. Failed bores shall be appropriately abandoned by the utility.

3.4.6.6 Drilling fluids shall be prepared and used according to fluid and drilling equipment manufacturer guidelines. The utility shall use fluid containment pits at both bore entry and exit points, and shall use appropriate operational controls in order to avoid heaving or loss of drilling fluids from the bore.

3.4.6.6.1 Antifreeze additives shall be non-toxic and biodegradable products.

3.4.6.6.2 Depending upon chemical composition or the specific method of disposal, improperly disposed drilling fluids may be classified as solid wastes or unauthorized discharges per Section 3.1.7, and in general, shall be pumped or vacuumed from the construction area, removed from the SH ROW and disposed of at permitted facilities that specifically accept such wastes.

3.4.6.6.3 Disposal of drilling fluids into storm drains, storm sewers, roadside ditches or any other type of man-made or natural waterway is expressly prohibited.

3.4.6.6.4 Small quantities of drilling fluid solids (less than 1 cubic yard of solids) may be left on-site after either being separated from fluids or after infiltration of the water, provided:

3.4.6.6.4.1 the drilling fluid consists of only water and bentonite clay; or

3.4.6.6.4.2 if required for proper drilling properties, small quantities of polymer additives that are approved for use in drinking water well drilling; and

3.4.6.6.4.3 the solids are fully contained in a pit, and are not likely to pose a nuisance to future work in the area; and

3.4.6.6.4.4 the solids covered and the area restored as required by permit requirements.

3.4.7 Utility Installations Near Drainage Ways and Watercourses

3.4.7.1 The utility shall not install any facility along or across the ROW of an irrigation ditch or canal company without first obtaining the written approval of such company.

3.4.7.2 The utility shall install facilities that cross a stream or other drainage only at a point beneath the bed of that watercourse and only at a depth that adequately allows for scour or ditch maintenance requirements. The utility shall also take the added measures to protect such lines that the Department deems necessary in areas subject to erosion or other disturbance.

3.4.7.3 In establishing the depth of cover below an unpaved channel, the Department will consider potential scour, ditch maintenance operations and/or future needs to increase the channel capacity. The utility line shall be installed a minimum of three feet below the lowest expected level of scour or degradation.

3.4.7.4 Utility construction operations within or near live streams, ditches, wetlands or other bodies of water shall include adequate provision to protect or maintain surface and/or ground water quality, and may require appropriate clearances as described in Section 3.1.7.

3.4.7.5 The utility shall not install utility lines within culverts where the primary purpose of that culvert is to carry drainage. For culverts or culvert-like structures where the primary purpose of the culvert is something other than drainage, such as providing passage for stock, wildlife, pedestrians or vehicles, utility installations shall be addressed through Section 3.3.10.

3.4.7.6 In order to avoid any interference with the operations or maintenance of either utility lines or of drainage structures, the utility shall not install utility lines inside any such drainage structure or inside the trench that surrounds any drainage structure, and shall maintain a horizontal and vertical clearance from any such drainage structure or surrounding trench if further directed to do so by the Department in the utility permit.

3.4.8 Protection, Construction and Restoration of Highway Property

3.4.8.1 The utility shall avoid disturbing or damaging all highway property, and shall be responsible for the prompt reconstruction, alteration, repair or maintenance of highway property, to repair any damage caused by the utility work, and to restore the SH ROW to pre-existing or better conditions as may be specified in the permit.

3.4.8.2 Cleated or tracked equipment shall not work on or move over paved surfaces without mats or pads on tracks.

3.4.8.3 The utility shall not spray, cut or trim trees, or other landscaping elements, or remove any landscaping material, unless such work is specifically described in the permit application and approved in the permit.

3.4.8.4 The utility shall employ erosion and sediment control measures, to protect storm water quality, in conformance with current Federal, State and local jurisdiction codes and Department standards. At a minimum, the utility shall employ the following measures, as applicable:

3.4.8.4.1 minimize the length of open trench; and

3.4.8.4.2 minimize the area of disturbance to ground cover and vegetation; and

3.4.8.4.3 manage necessary stockpiles in accordance with the permit requirements and appropriate CDOT Specification; and

3.4.8.4.4 protect all inlets accepting flow from the impacted area; and

3.4.8.4.5 seed and permanently stabilize the disturbed area to prevent erosion.

3.4.8.5 The utility may be required to obtain a storm water permit from the CDPHE per Section 3.1.7.13 and 3.1.7.20.

3.4.8.6 The utility shall perform any required construction or restoration of highway property in conformance with the Code, permit requirements, and with Department standard specifications and standard plans adopted by the Commission pursuant to § 43-2-107(1), C.R.S., as directed and provided to the utility by the Department. Material removed from any portion of the roadway template must be replaced in like kind with better or equal compaction. Segregation of material is not permitted.

3.4.8.7 All utility construction or restoration work shall be subject to Department approval, and the utility shall promptly replace all unsatisfactory work as determined by the Department.

3.4.8.8 The utility shall maintain any such finished work for a period of twenty-four (24) months following completion and acceptance, and must post a bond to assure the adequacy of construction or maintenance.

3.4.8.9 The utility shall remove all debris, refuse, waste, salvage, and surplus materials resulting from utility accommodation work from SH ROW in a safe and expedient manner, daily during installation and upon completion of such work.

3.4.8.10 The utility shall restore ditch flow lines and shall reseed or re-sod, as conditions dictate, all areas which are denuded of vegetation during utility operations. The seed species, origin and application rates required for each location shall be as approved by the Department. Seed mixtures and mulch must be certified free of noxious weed seeds. The utility shall clean equipment before transporting it into or out of the State in order to prevent the migration of noxious weeds.

3.4.9 Markers, Location Aids and Location Assistance

3.4.9.1 All new underground facilities must be electronically locatable when installed, including laterals up to the structure or the building being served.

3.4.9.2 All plowed or trenched installations must include appropriate color-coded warning tape placed not less than 12 inches vertically above the top of the line. The warning tape shall be surface-detectable if needed to facilitate detection of the line.

3.4.9.3 The utility shall place readily identifiable markers at the ROW line where it is crossed by pipelines carrying transmittants which are flammable, corrosive, expansive, energized, or unstable, except where a vent will serve as a marker.

3.4.9.4 The utility shall place markers for longitudinal underground facilities vertically above the facilities or at a known horizontal offset, unless otherwise approved in writing by the Department. Each marker shall provide a foresight and backsight to succeeding and preceding markers. Markers shall be installed at suitable intervals along tangent sections, at angle points or points of curvature, and at reasonable intervals along curves.

3.4.9.5 The utility shall maintain any markers required by the Code for the life of the installation.

3.4.9.6 In addition to complying with Section 3.4.3 of the Code and the provisions of Article 1.5 of Title 9 C.R.S. in response to the Department's notification of planned excavations, utility owners shall surface-mark their buried utility facilities that are located within the SH ROW in order to facilitate Department engineering and design activities, upon reasonable request from the Department, and at no cost to the Department. The permittee shall respond to such request within a reasonable timeframe acceptable to the Department, but no longer than 14 days from the date of request, and the accuracy of the surface marking shall be within 18 inch of either side of the actual location of the buried facility.

Transportation Commission (TC) Meeting Notes
Wednesday, December 18, 2024
Workshops and Regular Meeting
1:00 pm - 5:00 pm

Attendance:

Ten Transportation Commissioners were present: Chair: Terry Hart, Vice Chair: Eula Adams, Yessica Holguin, Rick Ridder, Todd Masters, Mark Garcia, Shelley Cook, Karen Stuart, Barbara Bowman, and Hannah Parsons. Commissioner Gutierrez was excused.

Youtube Recording Link for December 18,2024:
https://www.youtube.com/live/Caj5CTQ29NY

Transportation Commission Workshops

Pikes Peak Area Council of Governments (PPACG) Greenhouse Gas Transportation Report - Darius Pakbaz, John Liosatos, Will Mast, and Andy Gunning

Purpose and Action:

As outlined in Chapter 23, Section 134 of the Code of Federal Regulations, the Pikes Peak Area Council of Governments (PPACG) has been designated as the Metropolitan Planning Organization (MPO) for the Pikes Peak Urbanized Area. As the MPO in attainment for air quality conformity, PPACG is required to develop a regional transportation plan that is no more than 5 years old and has a horizon year no less than 20 years into the future. PPACG is preparing to adopt its 2050 Long Range Transportation Plan (LRTP). As required by SB21-260, PPACG must comply with State of Colorado Rule 2 CCR 601-22 that outlines emission reduction levels for the PPACG MPO area for the 2030, 2040, and 2050 analysis years. The action requested is for anticipated acceptance of the PPACG GHG Report at the January 2025 TC Meeting.

Discussion:

- PPACG Executive Director Andy Gunning reported that the Pikes Peak area was no longer in non-attainment, so they have different circumstances from DRCOG and NFRMPO.
- 20 years ago, voters approved a transportation investment mechanism that has been reauthorized twice since it passed, most recently this year for the next ten years.
- The report only focuses on the urbanized area of the Pikes Peak region. This includes Colorado Springs, Fountain, Monument, Palmer Lake, Manitou Springs, Green Mountain Falls, Woodland Park, and urbanized parts of unincorporated El Paso County.

- Improvements over the 2045 plan were highlighted including improvements to their land use forecasting methodology and travel modelling capabilities, transportation project mix to include twice as much multimodal project funding, and adopting a more collaborative approach between different jurisdictions in the region.
- The City of Colorado Springs approved a new Unified Development Code (UDC) that allows increased density and mixed use development, reduces parking requirements, encourages walkability, and introduces a “form-based zone” for downtown. These land use changes are supported by a new downtown circulator, improved bike lanes, roadway lane diets, an e-scooter and bike share program, and pedestrian safety improvements.
- $1.5 billion in projects across both plans, with 40% of the project mix dedicated to bicycle, pedestrian, multimodal, and transit solutions. Support for multimodal investments are noted by the following projects in the PPACG GHG Plan:
    - Enhanced transit corridors, Innovative Mobility Zones (last mile connectivity, car/van pool), new routes, improved infrastructure and route frequency.
    - Short term projects: Enhanced Transit Corridors on Academy Blvd and Platte Ave, Northeast Mobility Zone, and a shuttle route connecting CO Springs to Manitou and Garden of the Gods.
    - Medium term projects: Enhanced Transit Corridors on N Nevada Ave, S Nevada Ave, and Colorado Ave, connecting new mobility zones and tourist destinations to statewide transit (Bustang) system.
    - Long term projects: Enhanced Transit Corridors on Airport Rd and Tutt Blvd, new routes, service, and frequency improvements to remaining routes.
    - Transit Connections Study: The Division of Transit and Rail, CDOT Region 2, Mountain Metro Transit, and local jurisdictions identified projects in the region that align with CDOT’s transit goals.
- Commissioner Adams asked what the public process was, and what the process was to make sure the rural areas don’t get neglected. He further observed that the presentation did not include quantitative data showing where PPACG’s GHG emissions were now, and what reduction could be achieved by their plan.
- The impact on GHG from the plan will be modeled once preferred projects are selected.
- The urbanized area for PPACG includes areas identified in a “boundary smoothing” exercise, that includes rural areas within the urbanized area in anticipation that they will be developed. The rural areas in Park, Teller, and El Paso counties are covered by the Central Front Range TPR.
- Commissioner Parsons commented on the excellent work of the PPACG team.
- Commissioner Cook asked if the total includes the whole project cost, or just the relevant component? PPACG reported that it was the full project cost.
- STAC Chair Beedy asked if rural areas would be engaged about the 10-year plan. Darius Pakbaz replied that they would be engaged, as rural plans feed into the SWP.

Burnham Yard East Line Easement - John Putnam

Purpose and Action:

To seek TC approval, via resolution, of the purchase of the easement on the Burnham Lead Line at the negotiated price of $19,400,000.

Discussion:

- A workshop with CTIO last month determined there was no need to realign the lead line, and continued discussion with Union Pacific (UP) for purchase. $13.4M is the appraised value of the real estate, and $6M is a negotiated figure over the appraised value, reflecting the reduced operating capacity.
- Commissioner Adams asked for clarification on the $6M figure over the appraised value of the property. UP has a business benefit from operating a train on the Burnham Lead which allows them to access their customers from the north and south and bypass congestion on the consolidated main line. The $6 Million figure compensates UP for additional fuel costs, additional wear and tear, and the loss of the ability to bypass. The sale does not include a fiber optic cable along the ROW. UP will retain operation of the cable, and will be able to access it. Considerable public benefit comes from removing three at-grade crossings on the site.
- Commissioner Cook commented to support the purchase and highlight the fact there will be room for multiple lanes.

Legislative Update - Emily Haddaway and Jeff Sudmeier

Purpose and Action:

The Colorado General Assembly will reconvene in January for the 2025 Legislative session. There are several transportation-related legislative agenda items the Polis Administration is pursuing that CDOT would like to bring to the attention of the TC. This is an informational update and no action is needed at this time.

Discussion:

- Legislature reconvenes on 1/9/2025.
- Commissioner Adams asked about item R-04 - Reduce Road Safety Surcharge and Distribution.
- The Legislative Joint Budget Committee (JBC) hearing last week went well, despite the tight budget this year.
- **Item 1: MMOF Spending Authority**, requested an increase in spending authority as more dollars available than are able to be accessed, and roll forward authority was approved. Also requested considering this fund to be continuously appropriated.
- **Item 2: Continuous spending authority for Clean Transit Enterprise Cash Fund**, which is annually appropriated and currently goes out in the form of grants that may take years to be filled. Reduces administrative processes each year.
- **Item 3: Reduce SB21-260 Transfers and Extend the Funding**. Requested a reduction in the General Fund transfer to the State Highway Fund and an increase in future year

funding to ensure CDOT receives the total amount enacted in SB21-260. Would increase General Fund transfers in FY 2030-33. Would essentially buy time for Bustang operations funding to be developed and put into place.

- **Item 4: Reduce Road Safety Surcharge and Distribution Update.** Reinstate a reduction in Road Safety Surcharge by $11.10, leading to a net decrease of $65.1M annually in state revenue, subject to Tax Payer Bill of Rights (TABOR) regulations.
- Commissioner Garcia asked if the rail fund on the Clean Transit Enterprise fund was included at the workshop last month. He also stated he may have missed the meeting for the Clean Transit Enterprise, where he serves as TC representative, when this was discussed.
- Commissioner Adams asked if he was interpreting Item 4 correctly, that the state would be losing $66.2M in funding that it needs, but that the funds would come from somewhere else. The attempt to backfill would come from enterprises. Commissioner Adams expressed concern about the proliferation of enterprises in the State.
- Director Lew commented on enterprises, highlighting the effectiveness especially of the bridge and tunnel enterprise. This comment was to support the creation of a CDOT R.O.A.D. enterprise to address the State's road maintenance needs.
- **Proposal: Creation of the CDOT R.O.A.D. Enterprise and Expansion of the Bridge and Tunnel Enterprise**
    - The Bridge and Tunnel Enterprise has been successful. This proposal would increase the bridge safety surcharge and the revenue would be used to fund bridge and tunnel repairs, replacement, and maintenance. The surcharge would generate $45M in yearly revenue.
    - This proposal would create a new enterprise called the R.O.A.D. Enterprise. (ROAD stands for Road Operations, Asset Management, and Driveability). This enterprise would address Colorado's road condition. It would be funded by a new Road Impact Fee which is applicable to special fuels. This would generate $20M a year.
    - This is the first pass of this concept, a preview. The final iteration will be different as it is workshopped among stakeholders.
- **Proposal: Arriba Rest Area Project**
    - CDOT is requesting $281,672 to fund xeriscaping at the CDOT rest area.
- Commissioner Ridder asked that, since there was little pushback on the proposals from the JBC, what proposal would generate more pushback? Emily Haddaway responded that the JBC pushed back on most proposed budget cuts. They are likely to push back in particular to the Funding Advancements for Surface Transportation and Economic Recovery Act of 2009 (FASTER) and General Fund fee reduction.
- STAC Chair Beedy asked if the Arriba rest area xeriscaping project would include adding additional truck parking.
- STAC Chair Beedy asked why the impact fee is only being applied to trucks and not all vehicles using the road, especially when the proposed fee would raise $20M annually and the need is $350M. Emily Haddaway responded that Prop 117 in the Colorado constitution caps the amount a new enterprise can collect in the first five years at $100M, meaning that it can only collect a maximum of $20M for five years. After that,

the enterprise can grow, and that’s the plan behind it, to grow the enterprise into something more impactful after those first five years.

- Commissioner Stuart asked if creating this enterprise would preclude the Transportation Commission from adding more funds to asset management. It wouldn’t. Commissioner Stewart further followed up with STAC Chair Beedy’s concerns about parking at the Arriba rest area.
- Commissioner Hart complimented Emily Haddaway and Jeff Sudmeier’s presentation to the JBC. He also made a comment supporting xeriscaping at rest areas to reduce water usage.

Transportation Commission Regular Meeting

Public Comments

- Cory Gaines: Cory is a teacher who also writes for the Colorado Sun, based in Denver. He is hearing from readers that they are concerned about broadband coming to his area. Gaines expressed frustration not receiving responses to his communications with CDOT, and noted CDOT should be more responsive to public comments.

Comments of the Chair and Commissioners

- Commissioner Masters: Attended Eastern TPR last month. Well attended but with mild turmoil due to turnover of Regional Transportation Commission members of the Eastern Transportation Planning Region (TPR). Attendees saw a presentation on the revenue collected from overweight freight loads and there was a question in the meeting as to where that money went, as it did not go back to the roads.
- Commissioner Garcia: Attended Southwest TPR meeting earlier this month. Reported on Broadband Committee meeting: the funds generated about $35,000 from fees, not a huge source of funds. Providers are avoiding right-of-way (ROW) access, because of the fee. The Clean Transit Enterprise meeting was canceled for December.
- Commissioner Holguin: Highlighted conversations with community members on prohibiting handheld devices while driving taking effect in January 2025. Holguin wondered if there will be more efforts to inform people this is happening.
- Commissioner Cook: Third round of Mountain Rail meetings, one in Arvada was very well attended. Someone asked who would take Mountain Rail, and the majority of attendees raised their hand.
- Commissioner Parsons: Talked about the GHG report from PPACG. Mentioned many of the local programs in action, such as main streets and other grant programs that contribute to the PPACG GHG report.
- Commissioner Ridder: Complimented team on US 50 bridge. Ridder spoke with rail managers in other countries in the last few months, and learned that the quality of the physical rail is directly correlated with the satisfaction of the customers. This should be considered as Colorado pursues Front Range Passenger Rail and Mountain Rail.
- Commissioner Stuart: Nothing to report.

- Commissioner Bowman: Talked to Leadville area tourism office about the pullout at the top of aspen pass. Thanked Director Lew for attending the celebration of the reinstatement of Delta Airlines at Grand Junction Regional Airport.
- Commission Vice Chair Adams: Nothing to report.
- Commission Chair Hart: Attended a kick off for an intersection replacement between I-25 and US 50. Hats off to CDOT staff in getting that project going. Has received positive feedback from community members on the work getting done in Region 2.

Executive Director's Management Report - Shoshana Lew

- Kicked off snow fighter season and gathered with colleagues in the maintenance team in Section 2 to recognize the work that's been done and the work ahead.
- Preparing for the legislative session, including preparing an appearance before the Specific, Measureable, Achievable, Relevant and Time-bound (SMART) Act Team.
- Continuing work to get grant agreements wrapped up.
- Echoed Commissioner Holguin's concerns about hands free law, spoke about the requirements with the press.
- Colorado overtook California this month for new EV sales.
- Thanked maintenance teams for working over the holidays to keep everyone safe.

Chief Engineer's Report - Keith Stefanik

- $732M spent this year to date (YTD), if we take out the emergency fund, CDOT is at 97% of its forecast. We are 107% of the forecast if emergency funds are included. Blue Mesa Bridge repairs took emergency funding.
- In 2024 CDOT had four rejected bids out of 108 projects, lowest it has been for six years. This shows that the estimators are in tune with the contracting community.
- In 2024, CDOT had an average of 3.5 bidders for each project, the highest it has been for six years as well.
- For the 2025 forecast, CDOT is advertising 101 projects with a cost of $1.1B.

Colorado Transportation Investment Office (CTIO) Director's Report - Piper Darlington

- Did not hold a December board meeting. CTIO is going live with civil penalties for safety and toll enforcement on January 1st, we are currently in a warning period on I-25 S Gap, Central 70, and US 36.

FHWA Division Administrator Report - Andy Wilson

- The FHWA is celebrating closing out their first safe streets for all (SS4A) grant. It was a planning grant for the city of Castle Pines to complete a comprehensive safety action plan. Colorado has received 53 planning grants, passing directly from the Feds to the local government without passing through CDOT. Hopefully this leads to many safety projects across the state. Colorado has done a great job with pursuing federal grants.

Statewide Transportation Advisory Committee (STAC) Report - Gary Beedy, STAC Chair

- STAC did not meet in December, so there are no new updates. All the TPRs are working on their regional plans for the statewide 2050 plan. There is a feeling that preserving the system is the priority, and there isn't anything available for improvements for safety, capacity, passing lanes, and etc, especially for rural communities. Mobility on highways is vital to Colorado's economic vitality. The Transit and Rail Advisory Committee (TRAC) website seems to be out of date, and STAC needs info on meeting times and dates in order to send a representative.

Discuss and Act on Consent Agenda - Herman Stockinger

- Proposed Resolution #1: Approve the Regular Meeting Minutes of November 21, 2024
- Proposed Resolution #2: IGA Approval >$750,000 - Lauren Cabot
- Proposed Resolution #3: 1601 Greeley- US 34 "Merge" PD 1601 Interchange Request - Heather Paddock
- Proposed Resolution #4: State Transportation Improvement Program (STIP) Amendment- US 287 Safety Improvements - Jamie Collins

A motion by Commissioner Holguin was raised to approve, and seconded by Commissioner Ridder and passed unanimously.

Discuss and Act on Proposed Resolution #5: State Infrastructure Bank (SIB) Rate Update: Jeff Sudmeier

A motion by Commissioner Adams was raised to approve, and seconded by Commissioner Parsons, and passed unanimously.

Discuss and Act on Proposed Resolution #6: Burnham Yard East Line Easement - John Putnam

A motion by Commissioner Cook was raised to approve, and seconded by Commissioner Masters, and passed unanimously.

Adjournment

The meeting was adjourned at approximately 3:20 pm.

The next Transportation Commission meetings, workshops and regular meeting will be held on Wednesday, January 15, 2025 and Thursday, January 16, 2025.

Transportation Commission Memorandum

To: Transportation Commission
From: Lauren Cabot
Date: December 23, 2024

Subject: Intergovernmental Agreements over $750,000.00

Purpose

Compliance with CRS §43-1-110(4) which requires intergovernmental agreements involving more than $750,000 must have approval of the Commission to become effective. In order stay in compliance with Colorado laws, approval is being sought for all intergovernmental agencies agreements over $750,000 going forward.

Action

CDOT seeks Commission approval for all IGAs contracts identified in the attached IGA Approved Projects List each of which are greater than $750,000. CDOT seeks to have this approval extend to all contributing agencies, all contracts, amendments, and option letters that stem from the original project except where there are substantial changes to the project and/or funding of the project.

Background

CRS §43-1-110(4) was enacted in 1991 giving the Chief Engineer the authority to negotiate with local governmental entities for intergovernmental agreements conditional on agreements over $750,000 are only effective with the approval of the commission.

Most contracts entered into with intergovernmental agencies involve pass through funds from the federal government often with matching local funds and infrequently state money. Currently, CDOT seeks to comply with the Colorado Revised Statutes and develop a process to streamline the process.

Next Steps

Commission approval of the projects identified on the IGA Project List including all documents necessary to further these projects except where there are substantial changes to the project and/or funding which will need re-approval. Additionally, CDOT will present to the Commission on the Consent Agenda every month listing all the known projects identifying the region, owner of the project, project number, total cost of the project, including a breakdown of the funding source and a brief description of the project for their approval. CDOT will also present any IGA Contracts which have already been executed if there has been any substantial changes to the project and/or funding.

Attachments

IGA Approved Project List

Transportation Commission Memorandum

To: The Transportation Commission
From: Keith Stefanik, P.E. Chief Engineer
Date: December 27th, 2024

Subject: Parcel 47REV-EX, Marshall St & W. 49th Drive, Wheat Ridge, Jefferson County

Purpose

The purpose of this memorandum is to provide the Transportation Commission with the necessary supporting documents including legal descriptions and maps to declare Parcel 47REV- EX, acquired for CDOT Project No. QI 76-1(36), as excess property.

Action

In accordance with Colorado Revised Statute 43-1-210(5), the Department of Transportation is authorized, subject to approving resolution of the Transportation Commission, to dispose of any property or interest which, in the opinion of the Chief Engineer, is no longer needed for transportation purposes. CDOT Region 1 is requesting the Transportation Commission adopt a resolution to declare Parcel 47REV-EX of CDOT Project No. QI 76-1(36), as excess property and allow for its disposal.

Background

Parcel 47REV-EX located east of Marshall street and runs along the south side of W 49th Drive in the City of Wheat Ridge and the County of Jefferson and contains 30,587 Sq Ft (0.702 Acres) (+/-) of land that is located outside of the right of way necessary for Interstate 76. Parcel 47REV-EX was acquired by CDOT as part of Project No. QI 76-1(36) in 1976 for the construction of Interstate 76 (formerly State Highway 76).

Details

CDOT Region 1 has determined the disposal of Parcel 47REV-EX will not affect the operation, use, maintenance or safety of the highway facility. The property will be sold at fair market value to the adjacent property owner in accordance with C.R.S. 43-1-210(5).

CDOT will be relieved of maintenance responsibilities and liability associated with this parcel. CDOT will also obtain revenue from the sale of the parcel that will be applied to future transportation projects in accordance with Chapter 7 of the CDOT Right-of-Way Manual.

Next Steps

Upon approval of the Transportation Commission, pursuant to C.R.S. 43-1-106(8)(n); 43-1-110; 43-1-114(3) and 43-1-210; Code of Federal Regulations and Title 23, Part 710, Section 409 (23 CFR 710.409) CDOT will dispose of parcel 47REV-EX containing 30,587 Sq Ft (0.702 Acres) (+/-) of land that is no longer needed for transportation purposes to the adjacent property owner for fair market value.

Attachments

Legal Description with Exhibit

EXHIBIT "A"

PROJECT NUMBER: QI 76-1(36)
PARCEL NUMBER: 47REV-EX
DATE: October, 2024

DESCRIPTION

A tract or parcel of land No. 47REV-EX of the Department of Transportation, State of Colorado (CDOT) Project No. QI 76-1(36) containing 30,587 sq. ft. (0.702 acres), lying in SW quarter of Section 13, Township 3S, Range 69W, of the 6th Principal Meridian, in Jefferson County, Colorado, being portions of Parcel 47 Rev. (815062) and Parcel 30 (722902) of CDOT Project No QI 76-1(36) acquired by deeds recorded under reception numbers noted in parentheses and filed in the records of Jefferson County, Colorado said parcel 47REV-EX being more particularly described as follows:

COMMENCING from the South Center 1/16th Corner of Section 13, Township 3S, Range 69W, 6th P.M., which is a 2-1/2" aluminum cap in a range box S. 85°38'30" W., a distance of 1690.40 feet to a found No. 5 rebar with plastic cap, said point being the intersection between the northerly right-of-way of W 49th Drive and the easterly right-of-way of Marshall Street and **THE TRUE POINT OF BEGINNING**;

THENCE running through the aforementioned Parcel 47 Rev. and Parcel 30 the following four (4) courses and distances:

1. **THENCE** N. 70°00'32" E., a distance of 111.54 feet to a point;

2. **THENCE** N. 63°57'54" E., a distance of 156.96 feet to a point;

3. **THENCE** on the arc of a curve to the left, having a radius of 4016.07 feet, a central angle of 12°36'53", a distance of 884.21 feet (a chord bearing N. 57°37'55" E., a distance of 882.43 feet);

4. **THENCE** N. 80°35'42" E., a distance of 32.20 feet to a found nail with washer, said point being an angle point on the northerly right-of-way line of W 49th Drive and common corner between the lands now or formerly in the name of David Stefanich as recorded in Reception No. F0030474 among the land records of Jefferson County, Colorado and the lands now or formerly in the name of David A. Stefanich as recorded in Reception No. 2015083105 among the land records of Denver County, Colorado;

THENCE running on the existing northerly right-of-way of W 49th Drive the following five (5) courses and distances:

1. **THENCE** S. 48°53'17" W., a distance of 207.37 feet to a found No. 5 rebar with plastic cap, said point being the westerly corner of the aforementioned lands recorded in Reception No. F0030474;

2. **THENCE** S. 89°53'22" W., a distance of 2.65 feet to a found No. 5 rebar with plastic cap, said point being the northwest corner of the lands now or formerly in the name of David A. Stefanich as recorded in Reception No. 94085898 among the land records of Jefferson County, Colorado;

3. **THENCE** S. 57°18'52" W., a distance of 451.09 feet to a found No. 5 rebar with plastic cap, said point being a common corner between the aforementioned lands as recorded in Reception No. 94085898 and the lands now or formerly in the name of David A. Stefanich as recorded in Reception No. 2015028742 among the land records of Jefferson County, Colorado;

4. **THENCE** S. 57°38'39" W., a distance of 320.00 feet to a point;

5. **THENCE** S. 81°06'37" W., a distance of 216.68 feet to the **POINT OF BEGINNING**.

The above-described parcel contains 30,587 sq. ft. (0.702 acres).

Basis of Bearings: Bearings used in the calculations of coordinates are based on a grid bearing of N. 00°10'24" W. from the South Center 1/16th Corner of Section 13, Township 3S, Range 69W, 6th P.M., which is a 2-1/2" aluminum cap in a range box and the Center ¼ Corner of Section 13, Township 3S, Range 69W, 6th P.M., which is a 2-1/2" brass cap. The survey data was obtained from a Global Positioning System (GPS) survey based on the Colorado High Accuracy Reference Network (CHARN).

Authored For and on Behalf of the
Department of Transportation
Dane M. Courville, PLS 38548
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Fax:720-497-6901
Region 1 West

Sheet Revisions		
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Sheet Revisions		
Date	Description	Initials
mm/dd/yy	XXXXXXXX	XXX

Sheet Revisions		
Date	Description	Initials
mm/dd/yy	XXXXXXXX	XXX

Right of Way Exhibit

Project Number: QI 76-1(36)

Project Location: Wheat Ridge, CO

Project Code:	Last Mod. Date	Subset	Sheet No.
	10/22/2024		

10/22/2024 dreelinrj 4:01:00 PM C:\Users\dreelinrj\Desktop\Projects\DisposalProjects\N Harlan\N_Harlan_Disposal_Exhibit.dgn

Transportation Commission Memorandum

To: The Transportation Commission
From: Keith Stefanik, P.E. Chief Engineer
Date: December 27th, 2024

Subject: Parcel 350-EX, 3620 Morris Ave, Pueblo CO

Purpose

The purpose of this memorandum is to provide the Transportation Commission with the necessary supporting documents including legal descriptions and maps to declare Parcel 350-EX, acquired for CDOT Project No. NH-IR(CX) 025-1(126) Unit 3, as excess property.

Action

In accordance with Colorado Revised Statute 43-1-210(5), the Department of Transportation is authorized, subject to approving resolution of the Transportation Commission, to dispose of any property or interest which, in the opinion of the Chief Engineer, is no longer needed for transportation purposes. CDOT is requesting the Transportation Commission adopt a resolution to declare Parcel 350-EX of CDOT Project No. NH-IR(CX) 025-1(126) Unit 3 as excess property and allow for its disposal.

Background

Parcel 350-EX is located on the southeast corner of US Highway 50 and Morris Ave in the City and County of Pueblo and contains 15,377 Sq Ft (+/-) of land that is located outside of the right of way necessary for US Highway 50. Parcel 350-EX was acquired by CDOT as part of Project No. NH-IR(CX) 025-1(126) Unit 3 in 2011 for the construction of US Highway 50.

Details

CDOT Region 2 has determined the disposal of Parcel 350-EX will not affect the operation, use, maintenance or safety of the highway facility. The property will be sold at fair market value in accordance with C.R.S. 43-1-210(5).

CDOT will be relieved of maintenance responsibilities and liability associated with this parcel. CDOT will also obtain revenue from the sale of the parcel that will be applied to future transportation projects in accordance with Chapter 7 of the CDOT Right-of-Way Manual.

Next Steps

Upon approval of the Transportation Commission, pursuant to C.R.S. 43-1-106(8)(n); 43-1-110; 43-1-114(3) and 43-1-210; Code of Federal Regulations and Title 23, Part 710, Section 409 (23 CFR 710.409) CDOT will dispose of Parcel 350-EX containing 15,377 Sq Ft (+/-) of land that is no longer needed for transportation purposes for fair market value

Attachments

Legal Description with Exhibit

EXHIBIT "A"

PROJECT NUMBER: NHIRCX 0251-126
PARCEL NUMBER: 350-EX
PROJECT CODE: 91143
DATE: June 5, 2024
DESCRIPTION

A tract or parcel of land No. 350-EX of the Department of Transportation, State of Colorado Project No. NHIRCX 0251-126, containing 15,377 sq. ft. (0.353 acres), more or less, in the NE ¼ Section 14, Township 20 South, Range 65 West, of the 6th Principal Meridian, in Pueblo County, Colorado, said tract or parcel being more particularly described as follows:

Commencing the Southeast Corner of Lot 1, Country Club Corners Subdivision (Nail and Washer stamped 6635), said point also being the TRUE POINT OF BEGINNING;

1. Thence S10°05'35"W, a distance of 23.70 feet;

2. Thence S84°53'20"W, a distance of 77.11 feet;

3. Thence N43°34'55"W, a distance of 30.38 feet;

4. Thence N10°16'36"E, a distance of 26.29 feet to a point on said South line of Lot 1;

5. Thence N10°16'36"E, a distance of 60.47 feet;

6. Thence on the arc of a curve to the right, a radius of 76.11 feet, a central angle of 67°43'18", a distance of 89.96 feet, (a chord bearing N44°08'23"E, a distance of 84.81 feet);

7. Thence S79°52'32"E, a distance of 51.13 feet;

8. Thence S10°05'35"W, a distance of 131.07 feet to; The POINT OF BEGINNING.

The above described parcel contains 15,377 sq. ft. (0.353 acres), more or less.

Basis of Bearings: The basis of bearings for project reference is a line from Control Monument 1302 to Control Monument 1310 from CDOT Project: NHIRCX 0251-126 Unit 4, having a modified grid bearing of N 68° 01' 52" E at a distance of 625.07 feet.

For and on behalf of the
Colorado Department of Transportation
Paul M. Mandarich, PLS 38382
5615 Wills Blvd.
Pueblo, CO. 81008

COLORADO LICENSED
PAUL MICHAEL MANDARICH
38382
PROFESSIONAL LAND SURVEYOR

Colorado Department of Transportation
5615 Wills Blvd.
Pueblo, CO. 81008
Phone: 719-546-5736
Region 2

Sheet Revisions		
Date	Description	Initials
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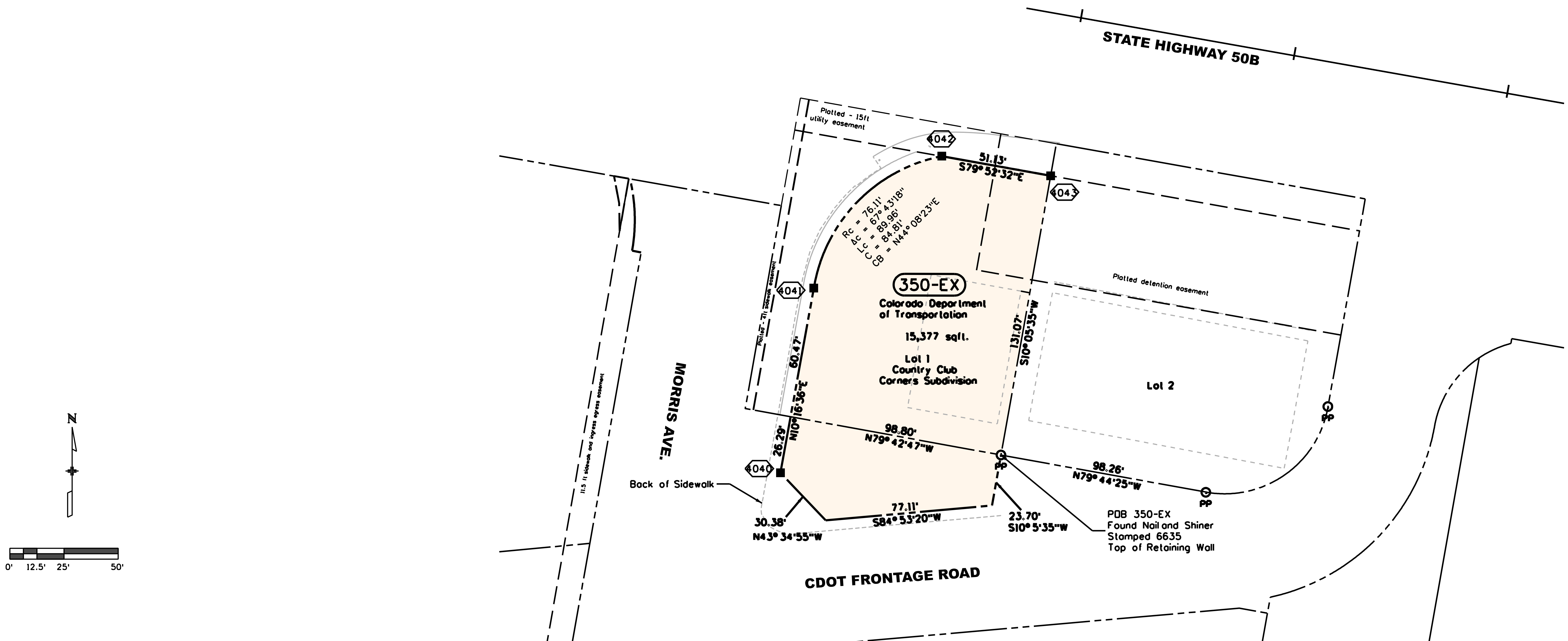
Sheet Revisions		
Date	Description	Initials
mm/dd/yy	XXXXXXXX	XXX

Sheet Revisions		
Date	Description	Initials
mm/dd/yy	XXXXXXXX	XXX

Right of Way
Exhibit "B"

NH-IR(CX) 025-1(126)
Project Location: Pueblo Colorado

Project Code:	Last Mod. Date	Subset	Sheet No.
91143	09/10/2024		



TABULATION OF R.O.W. MONUMENTS TO BE SET

Point No.	Northing(ft)	Easting(ft)	Description
4040	287,217.65	297,562.57	Type I Monument
4041	287,303.01	297,578.05	Type I Monument
4042	287,363.87	297,637.11	Type I Monument
4043	287,354.89	297,687.44	Type I Monument

R.O.W. TABULATION OF PROPERTIES IN PUEBLO COUNTY U.S. NO. 50B

Parcel No.	Ownership Name and Mailing Address	Site Address	Location	Area In Square Feet (Acres): Area Of Parcel	Existing ROW	Net Area	Remainder Left	Remainder Right	Book and Page No. And/Or Reception No.	Title Commitment No.	Remarks
350-EX	Colorado Department of Transportation	3620 US 50 West	E 1/2 Section 14	15,377					1873142		Excess Property to be Disposed
	2829 W. Howard Pl		Township 20 South, Range 65 West	(0.353)							
	Denver CO. 80204										

Region 2

Transportation Commission Memorandum

To: Transportation Commission
From: John Lorme, Director of Maintenance and Operations
CC: Herman Stockinger, Deputy Executive Director
Date: January 16, 2025

Subject: FY 25 Maintenance Project List

Purpose
The Maintenance Sections have identified projects valued at between $150,000 and $300,000 for construction in FY 25. The resolution details additions to project locations, type, and dollar value.

Action
Per CRS 24-92-109 and PD 703.0 CDOT is required to prepare estimates of proposed work exceeding $150,000 up to $300,000 for Transportation Commission approval prior to undertaking the work.

Background
The program allows the Maintenance Sections the flexibility to react to current needs by treating individual segments of highways showing distress.

Sufficient funds exist within the appropriate MPA's to pursue these projects. The projects are in accordance with the directive and all other requirements. The Division of Maintenance & Operations recommends approval of the projects on the FY25 $150K-300K list.

Next Steps
Upon approval, the Maintenance forces will proceed with construction of these projects in FY 25.

Attachments
Resolution for Transportation Commission Approval – Includes Project List

Transportation Commission Memorandum

To: Colorado Transportation Commission
From: Darius Pakbaz, Director, Division of Transportation Development,
Jamie Collins, STIP Manager, Division of Transportation Development
Date: January 2, 2025

Subject: Amendment to Include FASTER Safety Funding for US287 Safety Improvements in the STIP

Purpose

The purpose of this memo is to inform the Transportation Commission of the pending STIP Amendment to include $10.3 million for the US287 Safety Improvements project in the FY2025 – FY2028 STIP.

Action

Department staff is requesting your approval of the attached Amendment package so that CDOT may subsequently submit the Amendment to the Federal Highway Administration (FHWA) Colorado Division Office. Once the Amendment is approved, this funding will move from its 'pending' status to 'approved' in the STIP database in SAP.

Background

The US287 Safety Improvements project is a 10 Year Plan project that extends from Boulder County to the Wyoming state line. This amendment addresses the segments of US287 that fall within the Upper Front Range TPR. The Denver Regional Council of Governments and the North Front Range MPO are amending their respective TIPs for the segments that fall within their respective MPO areas. This amendment is to include the $10.3 million of FASTER Safety funding in the project.

Per 23 CFR 450, a required 30 day public comment period has been conducted. The comment period opened on November 25, 2024 and will close on January 15, 2025. To date, no comments have been received.

Next Steps

Once the Amendment is approved, Department staff will forward the Amendment package to FHWA and will approve the amendment in the STIP database in SAP.

Attachments

Attachment 1 – STIP Amendment table detailing the funding scenario for this project
Attachment 2 – Resolution for approval of this Amendment package

COLORADO
Department of Transportation

FY2025 - FY2028 STIP - Policy Amendment 3

for Transportation Commission Approval on January 16, 2025
Amounts in Actual Dollars

CDOT Region	STIP ID	STIP Description	Funding Program	FY2025 Amount	FY2026 Amount	FY2027 Amount	FY2028 Amount	Reason for Amendment
4	SR46600.107	US287 Safety Improvements	Faster Safety (FSA)	10,305,600				The project consists of approximately 15 distinct safety improvements on US287 between Ted's Place (MP 355) and the Wyoming Border (MP 385). Improvements include passing lanes, slope flattening, shoulder widening, intersection expansion and reconfiguration, signing and striping, and wildlife mitigation.

If you have any questions or comments regarding the amendment actions above,
please submit them to:

Jamie Collins, Colorado Department of Transportation
jamie.collins@state.co.us
303-757-9092

Comments will be taken until close of business on **January 15, 2025.**

Transportation Commission Memorandum

To: Transportation Commission
From: Darius Pakbaz - Director of Transportation Development, Chris Laplante - Air Quality and Climate Section Manager, Libba Rollins - GHG Specialist
Date: January 16, 2024

Subject: CDOT Staff Recommendation - 2024 PPACG GHG Transportation Report for the 2050 Long Range Transportation Plan

Purpose

CDOT staff recommends acceptance by the Transportation Commission of the 2024 Pikes Peak Area Council of Governments (PPACG) GHG Transportation Report for the 2050 Long Range Transportation Plan.

Action

Staff is recommending acceptance of the December 2024 PPACG GHG Transportation Report through resolution at the January 16, 2025 Transportation Commission Meeting.

Background

CDOT staff have been working collaboratively with PPACG since the adoption of the GHG Transportation Planning Standard to support compliance. As part of that effort, in 2022 the TC provided a $350,000 grant to PPACG to enhance their Travel Demand Modeling (TDM) platform to better support modeling sensitivity to bicycle and pedestrian mode choice, remote work, simulation based assignment and induced demand. PPACG's December 2024 submission of a GHG Transportation Report represents their first demonstration of compliance required by the Standard. PPACG provided materials and a presentation to the TC at the December 18, 2024 workshop. PPACG participated in the Statewide Model Coordination Group, which agreed on a set of modeling standards, as codified in the May 16, 2022 memorandum "Modeling Requirements to Meet Greenhouse Gas Standards" (Modeling Requirements). In addition, PPACG worked closely with CDOT's modeling staff to discuss questions and adopt modeling approaches to update their baseline (2 CCR 601-22, Section 1.04) GHG

emissions modeling of their 2045 Long Range Transportation Plan which was the last applicable planning document adopted as of January 30, 2022. This effort required PPACG to use their updated Travel Demand Modeling platform to determine their baseline GHG emissions for the compliance demonstration.
CDOT has reviewed PPACG's GHG Transportation Report, "PPACG 2050 LRTP Greenhouse Gas Report", and makes the following observations:

- PPACG's updated travel demand model meets or exceeds all standards in the Modeling Requirements memo.
- PPACG's report presents a variety of analysis describing the results of PPACG's model runs for the years 2030, 2040 and 2050, both baseline and compliance scenarios.
- PPACG's approach to depicting in their model the various programs and projects in their updated plan has been reviewed extensively together with CDOT. The greenhouse gas emission totals presented in Figure 27 of the GHG Transportation Report demonstrate compliance with the Standard. A key observation is related to the land use and population forecasting used in the 2045 LRTP baseline plan. As stated by PPACG on page 9 of their GHG Transportation Report, "The 2045 plan forecasted significant population growth in a few concentrated areas within the MPO". CDOT's recommendation for approval is dependant on PPACG working with CDOT modelers to conduct further evaluation of the impacts of this highly concentrated population growth forecast on the modeled results and recalculate the baseline GHG emissions modeling, as defined in section 1.04 of 2 CCR 601-22, prior to the next submittal of a GHG Transportation Report to the TC.
- CDOT management finds the planned approaches to achieve compliance through the selected strategies align with the goals of the Standard through increasing emphasis on multimodal, bicycle and pedestrian and transit projects. In addition, PPACG improved engagement on land use planning with local partners and represented those outcomes in their 2050 LRTP model. Some of the results include:
    - 69 fewer centerline miles of new roadway construction.
    - In 2030, four new transit routes/lines were added: University of Colorado, Colorado Springs /Colorado College service to downtown, Monument line, Falcon line, and Woodmen line. The North Academy and Voyager lines were coded with shorter 10 minute headway times to reflect planned service improvements.
    - In 2040, one new transit line was added: the Union South line. Shorter headways were coded to reflect improved service on the South Academy, Citadel, Union North, and Security Widefield lines.
    - In 2050, the FRPR station was added in downtown Colorado Springs with a 30 minute headway service to Denver, and a new transit line was added to Banning Lewis Ranch.

In summary, CDOT recommends approval by the Transportation Commission of the December 2024 PPACG GHG Transportation Report with a recommendation that PPACG work with CDOT modeling staff to update their baseline GHG emissions modeling associated with the 2045 Long Range Transportation Plan prior to their next GHG Transportation Report submittal.

Next Steps

The Commission will vote on acceptance of the report by resolution.

Attachments

B - PPACG's December 2024 GHG Transportation Report
C - Appendix 5.1 TDM Calibration and Validation Report
D - Appendix 5.2 MOVES Modeling Methodology Memo
Proposed Resolution #8

GHG Transportation Report

For the Pikes Peak Area MPO

GHG Transportation Report

For the Pikes Peak Area MPO

Submitted to the State Transportation Commission
Pursuant to Code of Colorado Regulations 2 CCR 601-22
December 2024

for the
2050 Long Range Transportation Plan

by the
Pikes Peak Area Council of Governments
15 S. 7th Street, Colorado Springs, CO 80905

Prepared in cooperation with, or financed in part through grants from:

Federal Highway Administration
Federal Transit Administration
Colorado Department of Transportation
Colorado Department of Health and the Environment
Local Member Government Contributions

Contents

1 Executive Summary

This *Greenhouse Gas Report* by the Pikes Peak Area Council of Governments (PPACG) presents the planning strategies employed by staff to produce a 2050 Long Range Transportation Plan (LRTP) that successfully supports a modelled reduction in greenhouse gas (GHG) emissions within the Pikes Peak Area Metropolitan Planning Organization (MPO), including the plan's land use forecast, transportation project mix, and modeling methods. This report demonstrates compliance with the requirements of the state's greenhouse gas rule (2 CCR 601-22) by meeting or exceeding the GHG reduction requirements recorded in Table 1 of the rule.

1.1 Key Highlights

Planning and Modeling Innovations

A collaborative land use forecasting approach replaces isolated methodologies, better aligning regional and local development initiatives into a comprehensive plan. The improved land use forecast is combined with an enhanced Travel Demand Model (TDM) that now includes reasonable remote work considerations, pedestrian and bicycle mode choices, and simulation-based traffic assignment.

Notable Regional Initiatives

A new Regional Transit Plan aligns with multimodal goals, detailing 58 projects including Enhanced Transit Corridors and innovative mobility zones. Investments in multimodal projects doubled compared to the previous plan, while several miles of major roadway projects were not advanced from the previous plan into the 2050 LRTP and removed from the model, emphasizing sustainability and equitable transportation access.

GHG Reduction Strategies

The 2050 LRTP incorporates a diverse mix of projects prioritizing multimodal transportation, including transit enhancements, pedestrian and bicycle infrastructure, and innovative mobility solutions that all promote environmentally positive changes in travel behavior.

1.2 Results

The 2050 LRTP exemplifies balanced, collaborative, and effective planning, seamlessly integrating environmental considerations into the region's long-term transportation strategies. The plan demonstrates full compliance with the state's greenhouse gas rule by exceeding the required reduction targets for all horizon years. For further details, please refer to the full report and Section 4.2 for specific emissions figures.

2 Introduction

2.1 Purpose

This report documents the actions taken by the Pikes Peak Area Council of Governments (PPACG) to incorporate regional Greenhouse Gas (GHG) reduction strategies into the planning and modeling processes of the 2050 Long Range Transportation Plan (LRTP) and satisfy the requirements of Colorado's transportation greenhouse gas rule specified in the Code of Colorado Regulations (2 CCR 601-22).

The planning measures, modeling methods, and emissions analysis results documented in this report demonstrate that the 2050 Long Range Transportation Plan complies with these regulations, and that no additional GHG Mitigation Measures, and by extension an annual Mitigation Action Plan, are necessary for PPACG to satisfy the rule's transportation GHG reduction requirements.

The approval of this GHG Transportation Report by the Transportation Commission is a prerequisite for the 2050 Long Range Transportation Plan to be considered fully compliant with all state and federal rules and regulations when adopted by the PPACG Board of Directors in 2025.

2.2 Background

In June 2021, the Colorado legislature passed Senate Bill (SB) 21-260, titled "Sustainability of the Transportation System." This legislation established new funding sources for transportation and mandated that the state Transportation Commission (TC) create guidelines and procedures to address greenhouse gas (GHG) emissions in transportation planning. It also directed the Colorado Department of Transportation (CDOT) to update statewide transportation planning rules to incorporate GHG reduction goals into specific planning documents adopted by CDOT and the state's Metropolitan Planning Organizations (MPOs).

The result of this effort was the adoption of the "Rules Governing Statewide Transportation Planning Process and Transportation Planning Regions" (2 CCR 601-22) by the Transportation Commission (TC) in December 2021. These rules address the GHG reduction requirements outlined in SB21-260 by setting GHG reduction targets for CDOT and each Metropolitan Planning Organization (MPO) across multiple forecast years. The initial GHG emissions projected from the forecasted land use and transportation network in each MPO's adopted plan were developed by CDOT in collaboration with Cambridge Systematics using the Energy Emissions Reduction and Policy Analysis Tool (EERPAT).

	2030	**2040**	**2050**
Initial GHG Emissions Estimated by CDOT for the Pikes Peak Area MPO	2.2	2.0	2.3

Figure 1: Table of the GHG emissions in Million Metric Tons (MMT) of CO2e (Carbon Dioxide equivalent) estimated by CDOT for the Pikes Peak MPO in 2030, 2040, and 2050

CDOT used the initial GHG emissions estimates, along with each MPO's share of statewide Vehicle Miles Travelled (VMT), to determine the required GHG reduction amounts in Million Metric Tons (MMT) of CO2e (Carbon Dioxide equivalent) for three forecast years: 2030, 2040, and 2050. These reduction amounts are reported for each MPO in Table 1 of the rule.

Table 1: GHG Transportation Planning Reduction Levels in MMT of CO2e

Regional Areas	2025 Reduction Level (MMT)	2030 Reduction Level (MMT)	2040 Reduction Level (MMT)	2050 Reduction Level (MMT)
DRCOG	0.27	0.82	0.63	0.37
NFRMPO	0.04	0.12	0.11	0.07
PPACG	N/A	0.15	0.12	0.07
GVMPO	N/A	0.02	0.02	0.01
PACOG	N/A	0.03	0.02	0.01
CDOT/Non-MPO	0.12	0.36	0.30	0.17
TOTAL	0.43	1.5	1.2	0.7

Figure 2: Table 1 in 2 CCR 601-22 identifies the GHG reduction amounts for PPACG in Million Metric Tons (MMT) of CO2e (Carbon Dioxide equivalent) emissions in 2030, 2040, and 2050

Currently, the Long Range Transportation Plan is the only applicable planning document for which PPACG is required to model GHG emission reductions; other PPACG planning products like the Transportation Improvement Program (TIP) do not require GHG modeling to comply with the rule.

2.3 Planning Area

The Pikes Peak Area Council of Governments (PPACG) boundary encompasses El Paso, Park, and Teller Counties, and serves as a regional forum for cities, towns, tribal governments, counties, transit agencies, and state agencies operating within the region to address common issues. While PPACG administers a variety of programs and services across the entire region, the Long Range Transportation Plan focuses on the Metropolitan Planning Organization (MPO) area.

Federally mandated and funded, MPOs are required to facilitate transportation planning for Census Urbanized Areas (UZA) with populations exceeding 50,000 people. The Pikes Peak Area MPO conducts long-range transportation planning through the LRTP and uses it to guide short-range programming of select federal and state transportation funds. The MPO area includes the cities of Colorado Springs, Fountain, Manitou Springs, and Woodland Park; the towns of Monument, Palmer Lake, and Green Mountain Falls; and urban portions of unincorporated El Paso and Teller Counties.

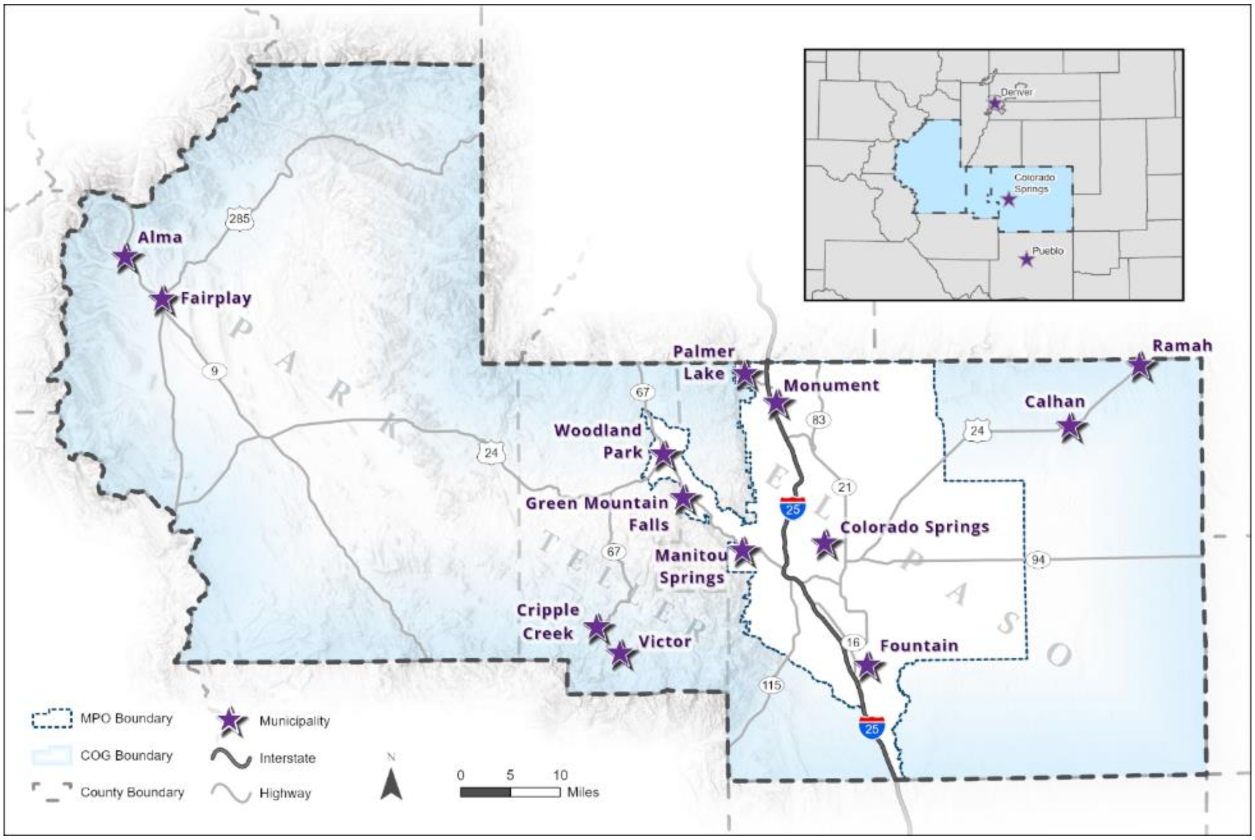


Figure 3: Map of the PPACG region and the MPO area

The Long-Range Transportation Plan (LRTP) is updated every five years and includes planning horizons of at least 20 years. Its primary purpose is to establish the region's transportation vision and goals, evaluate the system as a whole, and identify strategies to optimize the use of public funds in achieving these goals. The LRTP also provides a framework for decision-makers to consider the broader social, economic, and environmental impacts of transportation and land-use choices. Consequently, all transportation projects with the potential to significantly affect transportation or air quality within the metropolitan planning area must be included in the plan.

A critical component of the LRTP is the regional Travel Demand Model (TDM), a tool used to estimate future traffic volumes, average speeds, and travel patterns by analyzing factors such as population changes, land use, employment, and the transportation network. Updating planning assumptions and model inputs like residential locations, job distribution, housing density, transportation projects, and mode choice in the planning forecast can significantly influence predicted traffic volumes and roadway speeds. Projects included in the LRTP are integrated into the TDM to evaluate their impacts on the forecasted travel network and determine their alignment with the plan's goals, including GHG emission reductions.

Transportation projects outside the MPO are evaluated separately by CDOT and incorporated into their modeling process to meet the GHG reduction targets established for non-MPO areas of the state.

2.4 GHG Modeling Procedure

The GHG rule requires new transportation plans to incorporate projects and funding choices designed to model a reduction in GHG emissions relative to a baseline GHG amount in each of the prescribed forecast years. The baseline GHG amount is determined from the adopted plan in place when the rule became effective on January 30, 2022.

The baseline plan for the Pikes Peak Area MPO is the 2045 Long-Range Transportation Plan (LRTP), adopted by PPACG in January 2020. This plan was in effect as of January 30, 2022, and its forecasted population estimates, land use assumptions, and transportation network were used to establish the GHG reduction targets outlined for the MPO in Table 1 of the rule.

The new transportation plan, the 2050 LRTP, must demonstrate GHG emission reductions that meet or exceed the targets recorded in Table 1 of the rule for the compliance years 2030, 2040, and 2050, compared to the adopted 2045 plan.

Greenhouse gas emissions are estimated from these plans using the MOtor Vehicle Emission Simulator (MOVES), an emissions modeling program developed by the Environmental Protection Agency (EPA). MOVES utilizes many factors to estimate surface transportation GHG emissions, including:

- Traffic volumes and average speeds by time of day
- The type and age of vehicles in the region
- The vehicle fleet mix by roadway type
- Meteorological conditions
- Fuel types and fuel economy of the vehicle fleet mix
- The adoption rate of electric vehicles into the fleet mix over time

PPACG's only input for emissions modeling is the traffic volume and average speed along each roadway for each hour of a typical workday, generated by the regional Travel Demand Model. All other factors used in the MOVES emissions analysis are developed and maintained by the Air Pollution Control Division (APCD) within the Colorado Department of Public Health and Environment (CDPHE).

The GHG rule requires an Intergovernmental Agreement (IGA) between the APCD, CDOT, and PPACG to define the roles and responsibilities of each agency in conducting the emissions modeling. This includes establishing modeling standards and assumptions for PPACG's Travel Demand Model and specifying the methods and assumptions used by APCD to estimate the millions of metric tons (MMT) of carbon dioxide equivalent (CO2e) emissions generated by the model for each compliance year.

3 Plan Development

3.1 The 2045 LRTP and Model

The 2045 Long-Range Transportation Plan (LRTP) was adopted by the PPACG Board of Directors in January 2020. As the plan in effect on January 30, 2022, it serves as the baseline against which future GHG reductions are measured. Like most regional transportation plans, it contains a forecast of land use and population changes, along with a variety of fiscally constrained projects designed to address the region's transportation needs.

The 2045 LRTP's land use forecast was developed from population and workforce estimates provided by the state demographer's office, which served as regional control totals.

REGIONAL	2015	2020	2025	2030	2035	2040	2045
Population	701,483	758,232	819,138	880,361	940,711	1,001,120	1,055,656
Employment	364,561	401,735	434,104	468,176	495,948	518,862	541,984
El Paso County							
Population	677,022	732,993	791,904	851,955	911,290	970,825	1,024,521
Employment	354,681	390,309	421,464	454,501	481,509	503,824	526,450
Teller County							
Population	24,461	25,239	27,234	28,406	29,421	30,295	31,135
Employment	9,880	11,426	12,640	13,675	14,439	15,038	15,534

Figure 4: Population and employment forecasts from the 2045 LRTP

The distribution of population and employment, along with related household socioeconomic factors such as income and size, was modeled using UrbanSim planning software. The results were aggregated into distinct areas called Transportation Analysis Zones (TAZs), which serve as origins or destinations for trips modeled across the transportation network, such as home-to-work or home-to-school trips. TAZs with larger populations or higher concentrations of employees generate more trips to and from their zones. The 2045 plan forecasted significant population growth in a few concentrated areas within the MPO, while projecting a decline in population throughout much of the existing urban area.

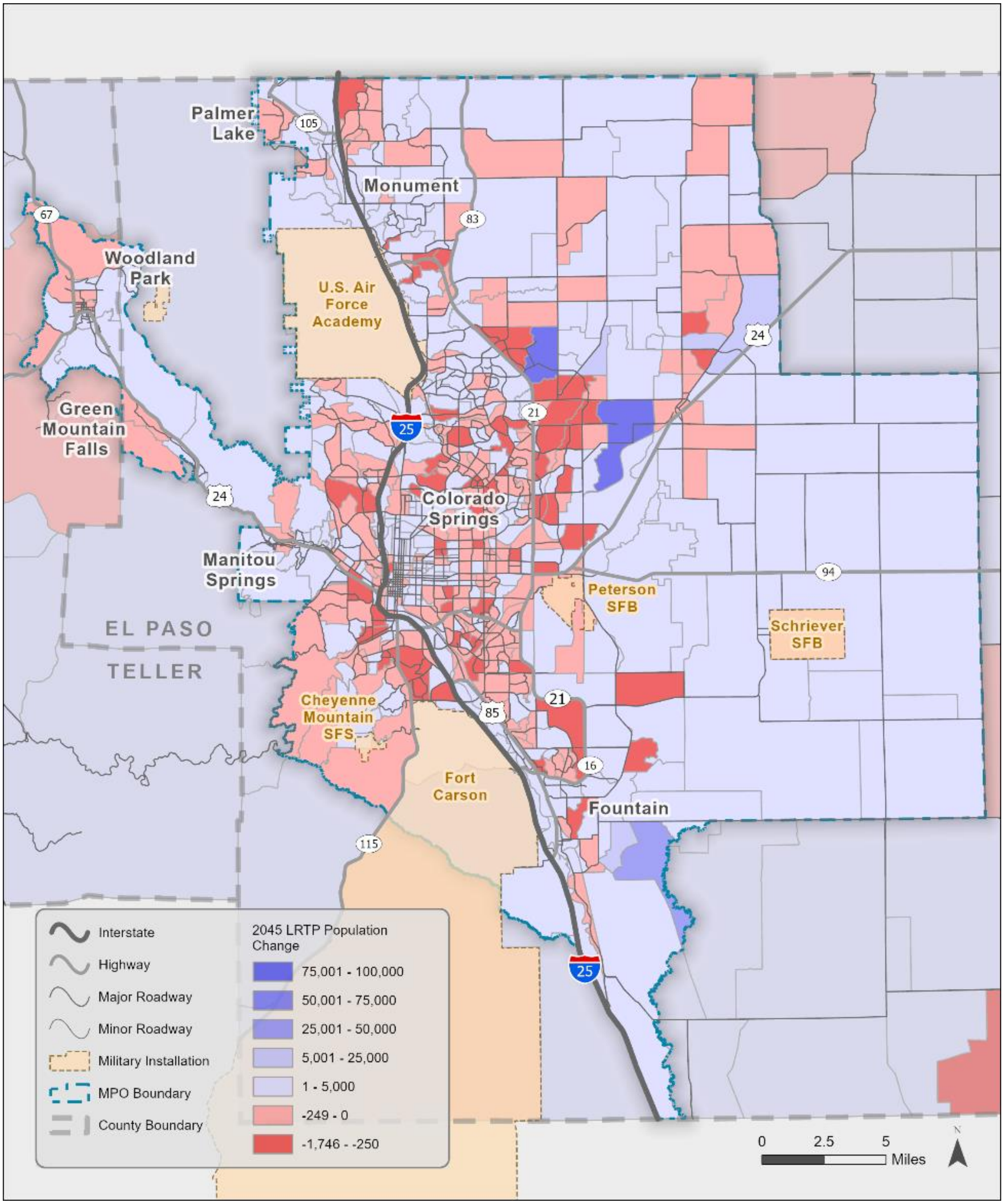


Figure 5: Map of forecasted 2045 LRTP population change

The forecasted population and employment changes were added to the regional Travel Demand Model (TDM) along with the plan's new roadway projects to estimate their combined effect on future travel patterns, and evaluate the alignment of future projects with the plan's goals of improving access, reducing pollution, and minimizing congestion. The TDM also incorporated several illustrative capital projects as part of a funding gap analysis, which identified unmet transportation needs that could be addressed in future plans if additional funding becomes available. Altogether, the 2045 LRTP travel demand model included 202 new centerline miles of major roadways added to the network over the 20 year forecast period. Since PPACG is not subject to air quality conformity analysis—which requires projects to align with staged implementation timeframes—the majority of the new roadway mileage was added between the 2030 and 2040 planning years rather than distributed across a staged timeline.

	2020		2030		2040	2045
Centerline Miles of Roadway in the MPO	**1,166 mi**	20 miles major new roads	**1,186 mi**	182 miles major new roads	**1,368 mi**	**1,368 mi**

Figure 6: Increases in the modeled centerline miles of roadway within the MPO from the 2045 LRTP

The 2045 LRTP also included a mix of transit funding and numerous bicycle and pedestrian projects, such as new multi-use urban trails, however, the travel demand model did not include any new transit lines and did not model pedestrian or bicycle trips as mode choice options.

Vehicle miles traveled (VMT) and population are closely related, as population growth typically drives increases in VMT. A larger population means more people traveling for various purposes, such as commuting to work, attending school, shopping, or accessing services. As the population grows, the number of vehicles on the road often increases, leading to more trips and longer travel distances. However, the relationship between VMT and population is also influenced by factors such as land use patterns, urban density, and transportation options. For example, in car-dependent, sprawling regions, population growth is likely to result in proportionally higher increases in VMT than similar growth in dense urban centers that better accommodate walking or transit mode choices. Understanding this relationship is critical for transportation planning, as it helps predict future travel demand and assess environmental impacts like greenhouse gas emissions.

	2020	2030	2040	2045
VMT in the MPO Area	12,659,333	16,800,165	18,120,837	18,319,508
Total Traffic Volume in the MPO Area	60,621,529	78,640,926	78,983,836	79,485,959

Figure 7: Vehicle Miles Traveled (VMT) and traffic volume in the MPO from the 2045 LRTP

3.2 The 2050 LRTP Land Use Forecast

PPACG collaborated with its local government members, particularly planners from Colorado Springs and El Paso County, to evaluate the strengths and weaknesses of the land use forecast developed for the 2045 LRTP. A primary concern was the forecast's overemphasis on population growth in two major planned developments, which understated the potential impact of urban infill initiatives and affordable housing projects in other areas of the MPO. In agreement with these concerns, PPACG committed to adopting a new approach for the land use forecast in the 2050 LRTP.

For the 2050 LRTP model, PPACG moved away from independent forecasting using tools like UrbanSim and adopted a more collaborative approach, creating a regional "best-fit" model from all the development plans of its member governments. The process allowed known developments and entitlements to be accounted for in the regional land use forecast alongside the use of historical data like accessory dwelling unit (ADU) permits and residential build rates. When concurrent growth scenarios from multiple jurisdictions ended up exceeding the population control totals, round-table discussions were held to evaluate where growth might be tempered based on historical trends, current and expected development incentives, and utilities requirements.

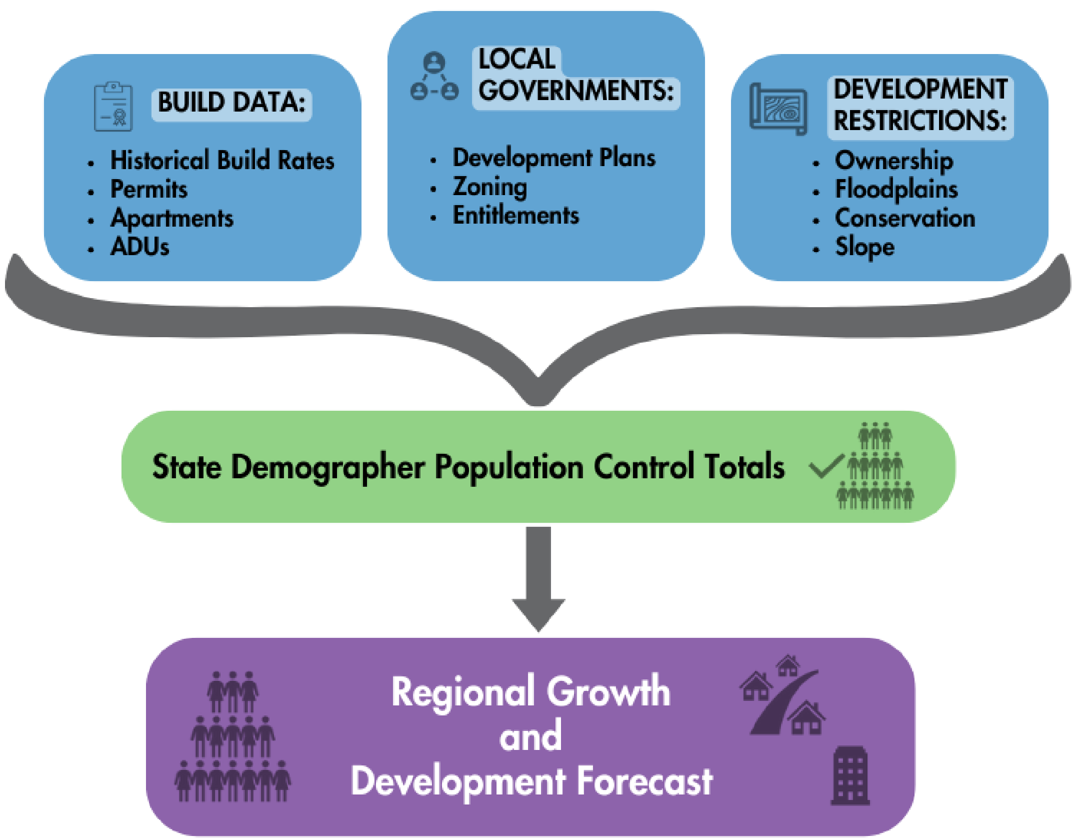


Figure 8: 2050 LRTP Land Use Forecast Process

This effort resulted in a new regional growth dataset that offers a unified development outlook for the entire MPO area, transcending jurisdictional boundaries while still effectively capturing their planned development patterns. The dataset enables quick evaluation of plans across jurisdictions, facilitating coordination of regional, state, and federal funding initiatives, such as programs for transit-oriented communities or mixed-use developments. Widely embraced by local government and utility planners, the dataset is now a fully maintained resource, supported by ongoing collaborative meetings where updates and changes are reviewed collectively. This process ensures the "best-fit" regional picture is continuously refined as annexations, entitlements, and other development plans are updated.

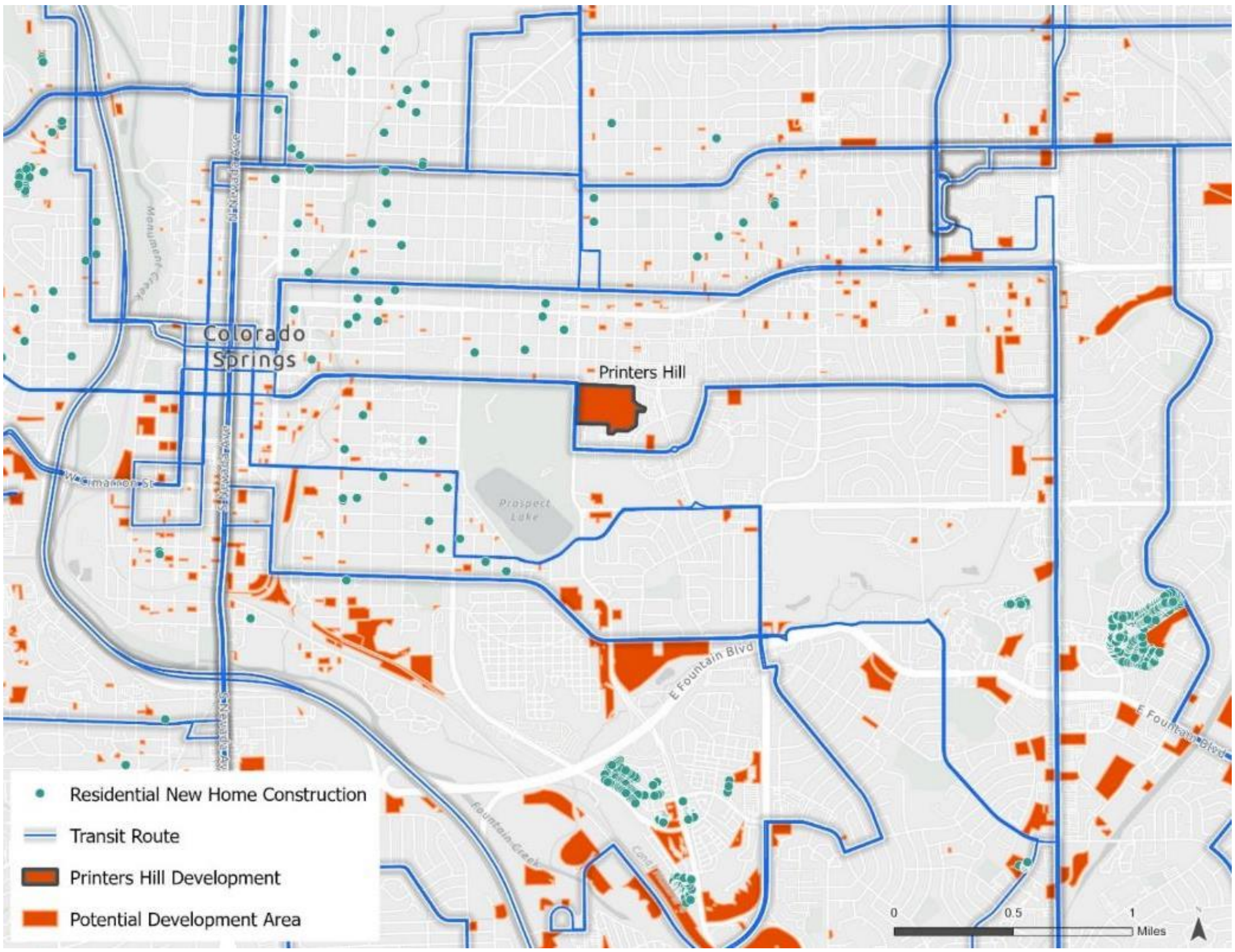


Figure 9: Overview map of the Regional Growth and Development dataset and new home construction in central Colorado Springs, both used to help identify and estimate future land use changes

The new land use model also introduces a transparent approach to employment forecasting. Instead of relying on a "black box" method, it uses development plans, zoning, and entitlements to estimate both the type and number of jobs expected from future commercial and industrial ventures.

Figure 10: A detailed map of the Printers Hill development plan showing housing unit densities, commercial area, and neighboring parks, transit, and other development areas that are all used to forecast changes in population, employment, and trip generation in this area

The 2050 LRTP land use forecast outlines the anticipated growth and distribution of population and jobs in a cohesive framework that adheres to regional control totals while more accurately reflecting the planning and development goals of the region's local governments.

	2030	**2040**	**2050**
2050 LRTP Population Forecast	858,962	958,237	1,023,259
State Demographer's Population Forecast (Control Total)	859,427	958,942	1,023,342

Figure 11: Forecasted population from the 2050 LRTP compared to the state demographer's forecast

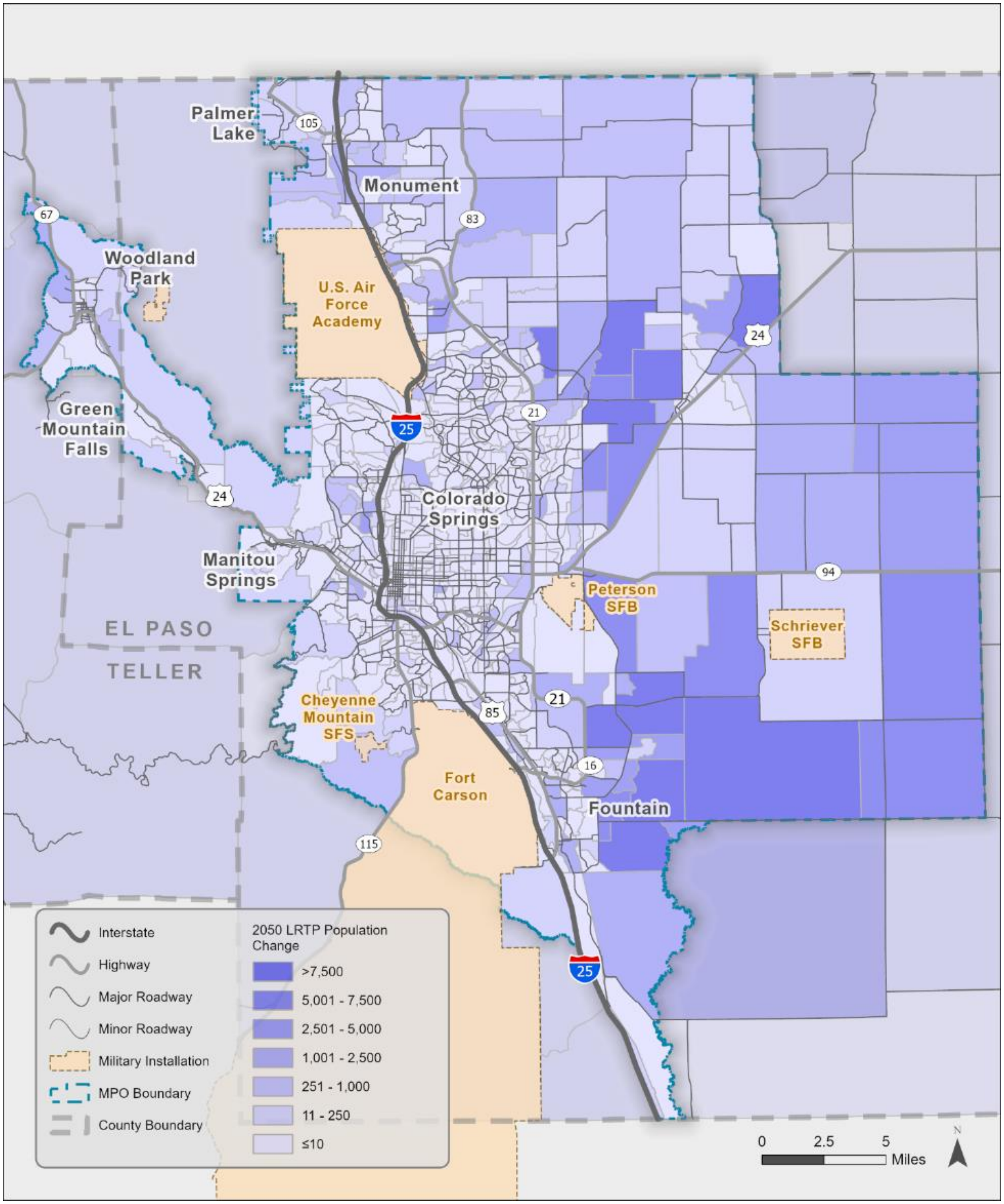


Figure 12: Map of forecasted 2050 LRTP population change

Figure 13: Table of the five employment categories used in the 2050 LRTP and their forecasted change 2020 to 2050

3.3 The 2050 LRTP Travel Demand Model

Senate Bill (SB) 21-260 not only established guidelines to address greenhouse gas (GHG) emissions in transportation planning but also expanded the goals of the Multimodal Transportation and Mitigation Options Fund (MMOF) to support improvements to travel demand models. In 2022, the Transportation Commission (TC) awarded PPACG a grant from the state's MMOF to enhance its Travel Demand Model (TDM) with specific improvements designed to enhance sensitivity to GHG emissions modeling:

- **Pedestrian and Bicycle Mode Choice**
- **Remote Work Considerations**
- **Simulation Based Assignment**
- **Induced Demand Sensitivity**

PPACG collaborated with the PTV Group to implement those and several other updates for the 2050 model, enhancing the model's overall accuracy, efficiency, and ability to forecast different scenarios. The resulting 2050 TDM is a tour-based model that integrates detailed roadway facilities, transit lines, synthetic population at the household and person levels, as well as land use variables such as employment, student enrollment, and shopping activity. With a base year of 2020 to align with Census data and the land use model population, the TDM was calibrated to reflect average daily traffic using counts from both 2019 and 2021. Further, hourly traffic counts were utilized to fine-tune hourly travel demand, supporting dynamic traffic assignment.

The model's key improvements are summarized below, with the full calibration and validation report, including detailed methodologies, available as an appendix item for further review.

3.3.1 New Transportation Analysis Zones (TAZs)

The original TAZ system in the PPACG model was updated to align with the 2020 Census block boundaries and further refined to separate commercial, residential, and military areas into more homogenous zones. These revisions increased the number of zones from 802 to 945, enhancing land use fidelity while maintaining alignment with Census boundaries, simplifying the incorporation of Census data. Additionally, zone connectors—used as access points for traffic and transit trips entering or exiting the network—were improved by adding “stub links” to the network. This change eliminated illogical loading directly into intersections and ensured consistency across both static and dynamic network assignments.

Figure 14: A detailed map of a 100% commercial TAZ surrounded by zones that are almost 100% residential, ensuring that all trips to and from the businesses in this zone are captured in the model

3.3.2 New Population Synthesizer

The PPACG travel model relies on a disaggregate synthetic population to represent individual households and people. This approach enhances the model’s ability to analyze travel behavior across various demographic groups and incorporates factors like work-from-home scenarios more effectively. For the updated model, PPACG partnered with PTV to implement PopulationSim, a more advanced population synthesizer than the PopGen system used in the 2045 model.

PopulationSim uses an entropy-maximization method to balance data and generate consistent population weights. This ensures that variables not directly controlled—such as household size or income—remain accurately distributed while avoiding unrealistic weight expansions. The model also allows for "importance factors," which adjust the emphasis on different data inputs based on their reliability.

Another key advantage of PopulationSim is its ability to process all geographic areas simultaneously. This prevents errors common in sequential models like PopGen, which can misrepresent smaller population segments such as university students or low-income households. By using simultaneous list balancing, PopulationSim produces a more accurate synthetic population for these groups.

The result is a refined synthetic population that better represents individual and household travel characteristics. This includes detailed socioeconomic variables like income, job type, household composition, and more—creating a model that more accurately reflects real-world transportation choices across diverse populations in the region.

3.3.3 Added Pedestrian and Bicycle Mode Choice

As previously mentioned, the 2045 model lacked the capability to account for pedestrian or bicycle mode choices. To address this, PPACG staff first conducted an extensive GIS analysis to identify all roadways with bike lanes, multi-use shoulders, adjacent trails, and sidewalks. This data was then incorporated into the updated travel demand model network to identify where bicycle and pedestrian mode choices could potentially be utilized when assigning trips between TAZs.

The mode choice probabilities for taking a walk or bike trip are calculated at the individual level based on a variety of person and household attributes derived from the enhanced population synthesizer. For example, reflecting differences in surveyed travel behavior, university students are more likely to choose walking or biking compared to individuals over the age of 65.

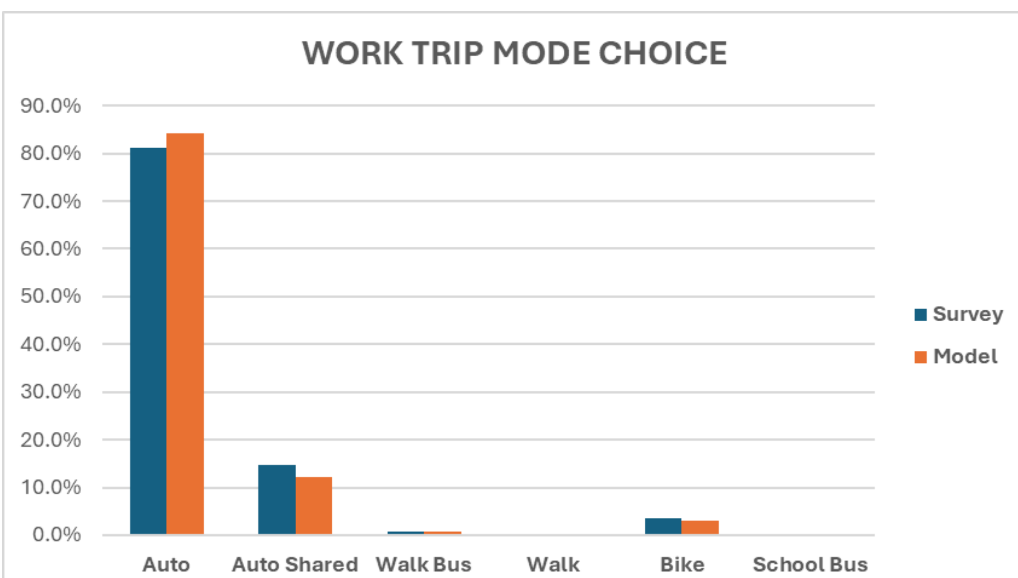


Figure 15: Table showing the distribution of work trip mode choice in the 2050 LRTP model

These mode choice options are fully integrated into each individual's activity chain, enabling the model to represent multi-modal tours for individuals with applicable mode-choice options. This ability is especially useful when modeling non-work trips. For instance, a worker who drives to the office still has a probability of choosing to walk to and from lunch as part of their tour, whereas a person who walks to work won't have a probability of driving to lunch but may choose to share an auto trip or use a rental e-bike if they choose not to walk. A range of possibilities such as these are now accurately represented in the model, allowing a more realistic depiction of pedestrian and bicycle trips throughout the network.

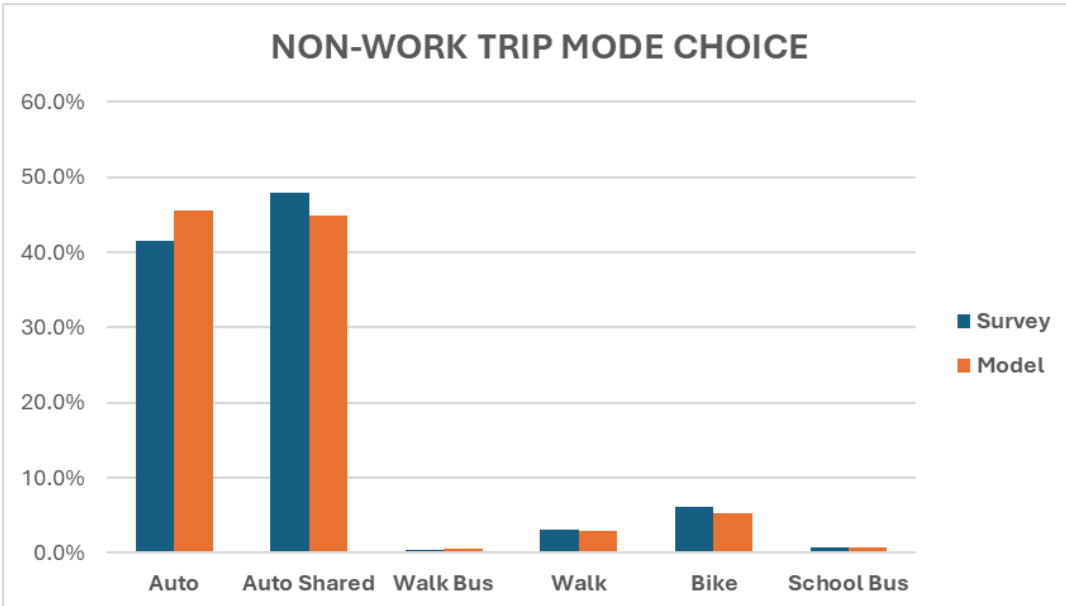


Figure 16: Table showing the distribution of non-work trip mode choice in the 2050 LRTP model

3.3.4 Account for Remote Work

A work-from-home component was integrated into the model using socioeconomic data to estimate the likelihood of remote work based on household attributes such as income and job type. To establish initial remote work frequency coefficients, PTV adopted data from the San Diego Association of Governments (SANDAG) travel demand model, which shares similarities with the PPACG region, including a significant military population and the use of PopulationSim. These coefficients account for multiple remote work options, such as hybrid environments where an individual works remotely only two days a week, and were then calibrated for the PPACG region using available remote-work survey data.

PTV ensured the framework for setting remote work probabilities remains adaptable to evolving employer policies. This flexibility is crucial given the ongoing changes in remote work practices post-pandemic. Additionally, the tour generation model accounts for workers whose roles inherently prevent remote work, such as those in the military, manufacturing, or delivery industries.

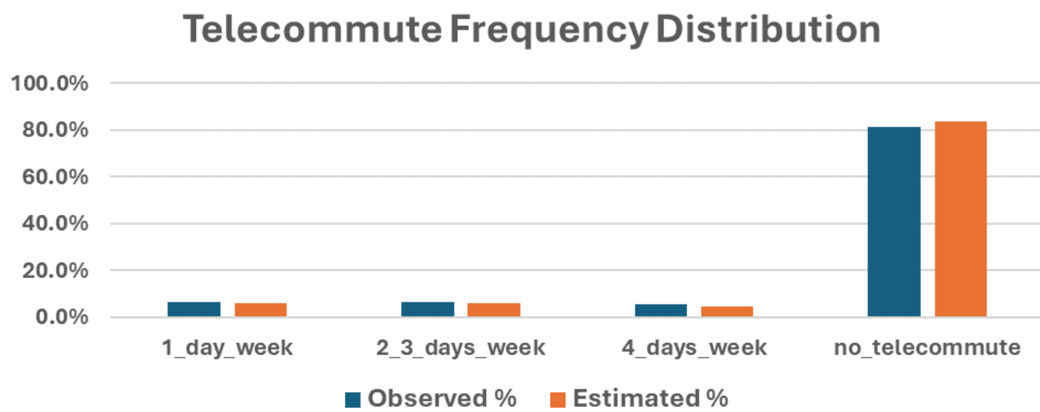


Figure 17: Table showing the distribution of remote work frequency in the 2050 LRTP model

3.3.5 Simulation Based Assignment

One of the most significant upgrades to the travel demand model is the implementation of a full Simulation-Based Assignment (SBA) procedure. SBA dynamically assigns traffic by simulating individual vehicles and persons traveling within the network. This allows the model to realistically represent intersection delays, including the forming and dissolving of queues over time, enabling signal timing efficiencies and operational improvements to influence mode choice and routing.

This upgrade required the model network to be carefully reviewed for the correct number of roadway lanes, posted speeds, and intersection control types. Aerial imagery was used with GIS to code detailed intersection geometry with appropriate turn bays and lane grouping for over 1,500 intersections in the model network.

There are approximately 700 signalized intersections in the network. To simulate traffic queues forming at these intersections, signal phasing plans were developed based on the lane grouping at each approach leg. Green times and splits were calculated using the turn flows obtained from the static traffic assignment, providing a consistent representation of delay across the network. This methodology also ensures compatibility across forecasted network scenarios.

Simulation-Based Assignment (SBA) provides a more accurate reflection of congestion-related impedance compared to static assignment methods. For instance, vehicles waiting through multiple light cycles at a congested intersection have their "stop-and-go" queue times factored into the average vehicle speeds recorded for that link. This level of detail enables SBA to better represent dynamic traffic conditions and travel times during specific timeframes, enhancing the model’s precision.

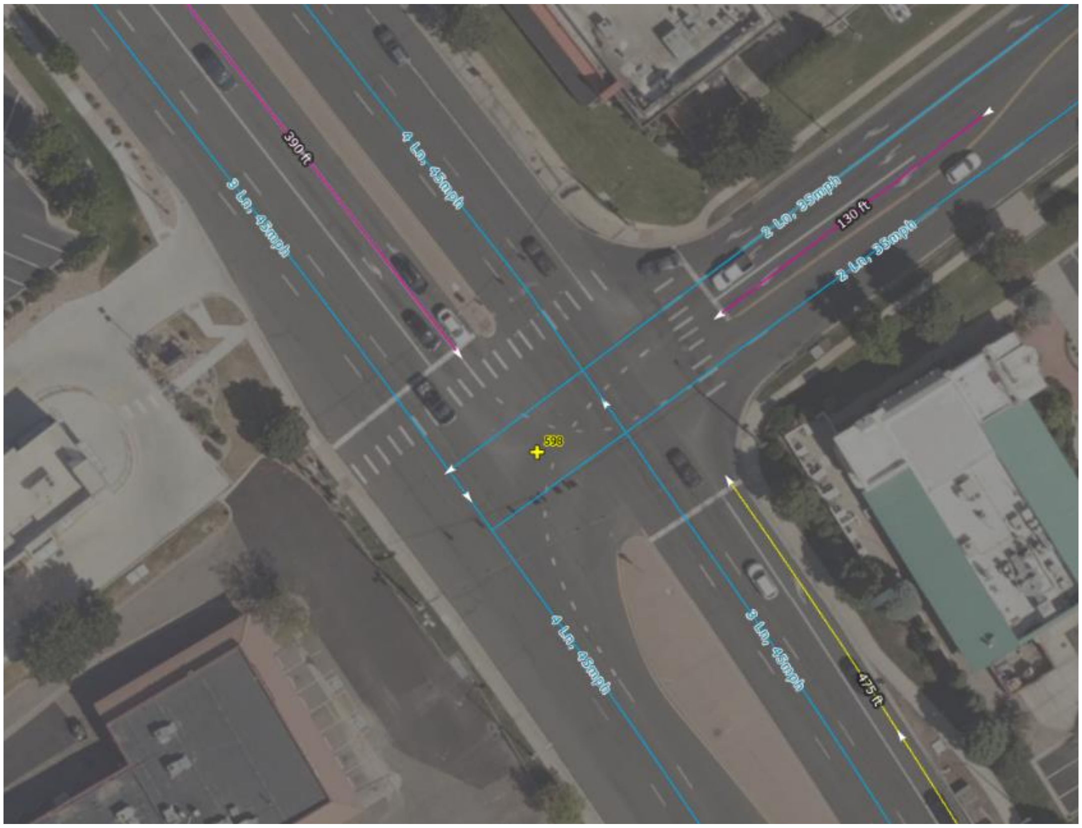


Figure 18: Map of an intersection modeled in GIS with lane count, speed, and geometry, including pocket turn lanes, accurately recorded

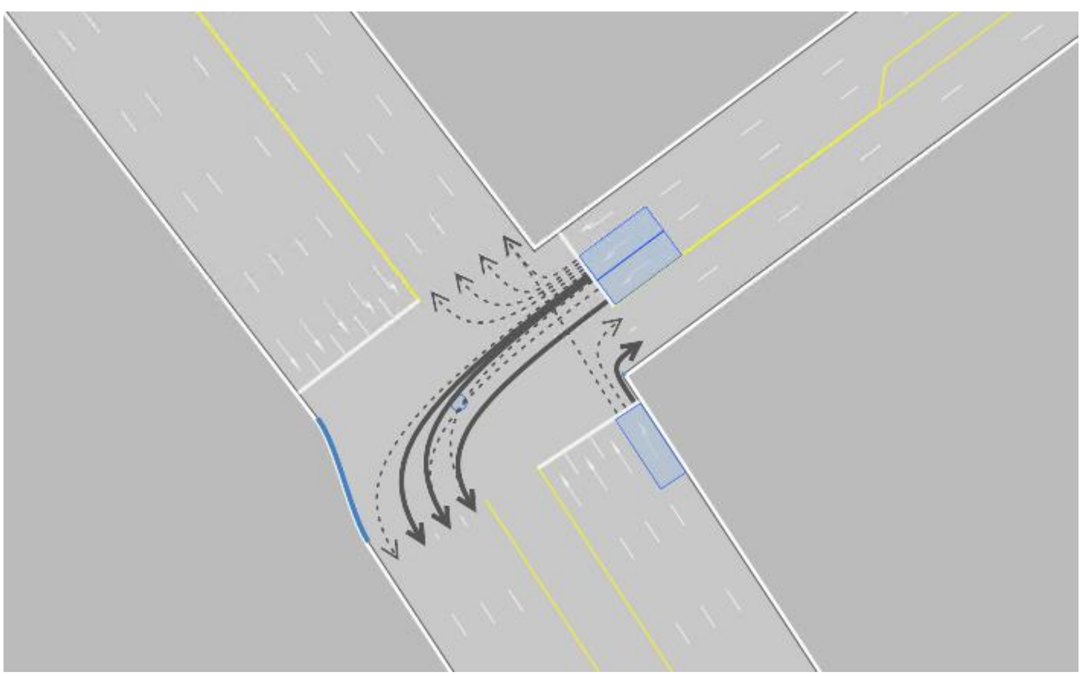


Figure 19: The same intersection as shown in Figure 18 is displayed in the travel model, with all lanes accounted for and allowable turning movements seen for selected lanes

SBA is a powerful tool for transportation planning, enabling more precise simulations of traffic flow and allowing PPACG to work collaboratively with local planners to assess network impacts dynamically. For instance, SBA can evaluate the effects of adjusting signal timings to reduce congestion, analyze the improvement in average vehicle speeds from replacing a congested intersection with an interchange, or model induced demand resulting from such improvements through the reallocation of trips to more attractive routes.

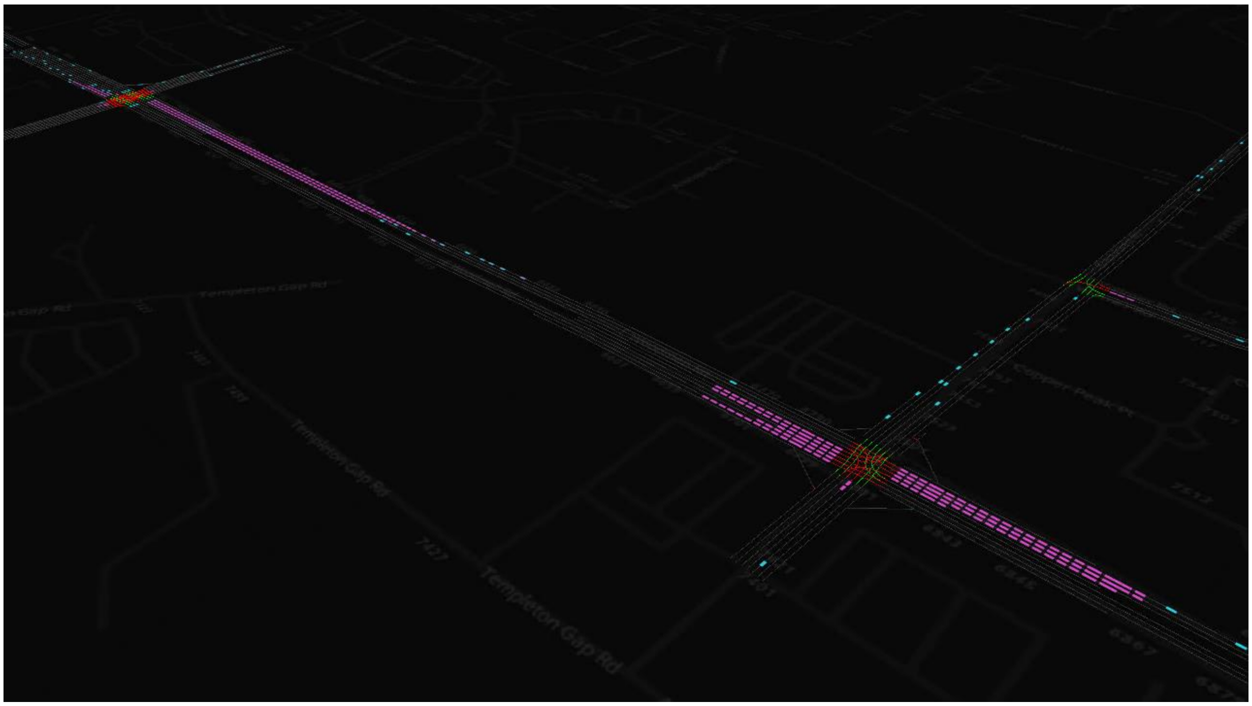


Figure 20: A screen capture of SBA traffic animation along Woodmen Rd in Colorado Springs, with pink vehicles queuing at signalized intersections during the morning commute while the light blue vehicles are in motion along the network

The new 2050 LRTP travel model enables transportation engineers and planners to evaluate the impacts of various scenarios, such as changes in population, employment centers, travel behavior, or infrastructure improvements. By projecting future traffic volumes, the model helps avoid the costs of constructing unnecessary roadways or waiting for severe congestion to develop.

3.4 2050 LRTP Project Mix

The primary purpose of the Long-Range Transportation Plan (LRTP) is to define the region's transportation vision and goals, assess the overall performance of the system, and develop strategies to maximize the effectiveness of public investments in achieving these objectives. To support this mission, the 2050 LRTP incorporates a diverse array of projects submitted by local governments through a collaborative scoring process. These projects are prioritized with input from the Transportation Advisory Committee (TAC), reviewed by other PPACG committees, and refined through public engagement before being adopted by the PPACG Board of Directors. Once adopted, the projects become eligible for funding from various state and federal programs based on their alignment with each funding program's purpose and eligibility requirements.

3.4.1 Project Funding

The funding available through each program varies annually based on revenue. As of fiscal year 2025, the Pikes Peak region receives approximately $9 million in Surface Transportation Block Grant (STBG) funds, $900,000 in Transportation Alternatives Program (TAP) funds, $1.2 million in Carbon Reduction Program (CRP) funds, and $1.4 million from the Multimodal Transportation and Mitigation Options Fund (MMOF) each year. The specific eligibility requirements of each program means not all funds can be used to support all project types. For example, TAP and MMOF are generally restricted to multi-modal projects like bicycle and transit initiatives. STBG is the most versatile funding source, supporting a wide range of projects and the only funding stream managed by PPACG that can be applied to most roadway projects, including bridge repairs, operational improvements, roadway construction, and can also be flexed to transit.

Extended out from 2020 to 2050, the LRTP financial plan estimates approximately $240.8 million in STBG funding, along with $23 million from TAP, $30.2 million from CRP, and $32.9 million from MMOF, all contingent on securing local matching funds. PPACG also calculates additional funds of approximately $200 million from other discretionary capital grants, and $2 billion generated from the local Pikes Peak Regional Transportation Authority (PPRTA) over the same period. These projections do not include transit-specific funding allocated to Mountain Metropolitan Transit, such as FTA 5307 and other federal funds, which are detailed separately in the Regional Transit Study.

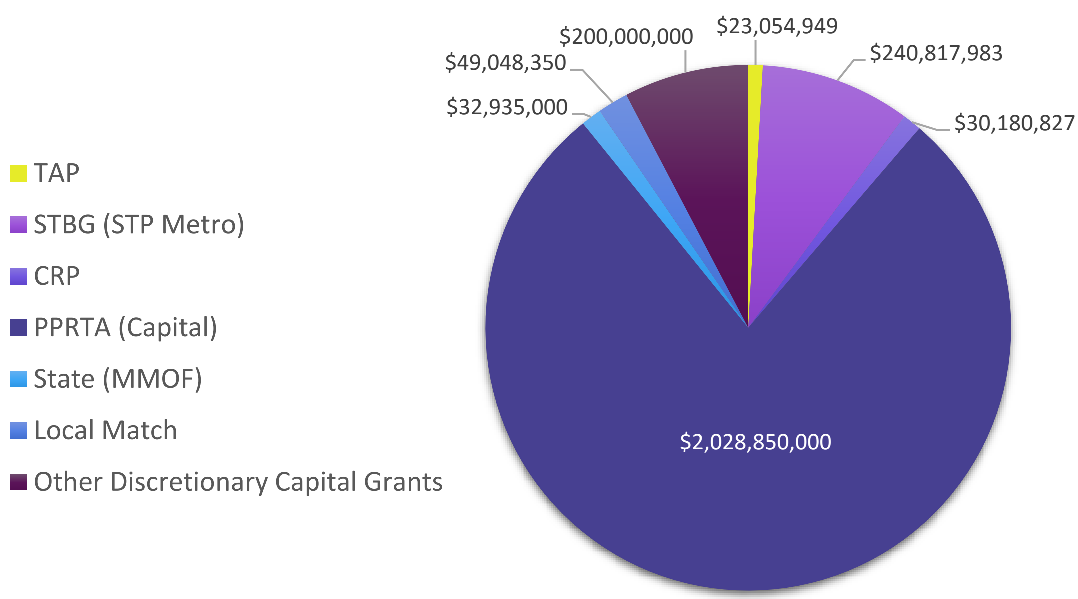


Figure 21: Chart of projected transportation funds by program type from 2020-2050

3.4.2 Project Types

Classifying the entire LRTP project list by type presents challenges because many projects encompass multiple elements that could influence their classification. For instance, the CDOT project to widen the section of US24 stretching from CO21 to Stapleton Road is categorized as a capacity project due to the addition of lanes, yet a significant portion of its funding also addresses corridor safety and operational improvements. For this report, projects are classified according to a primary project type and a secondary type based on their most significant components, and therefore the same project may be counted in two separate categories.

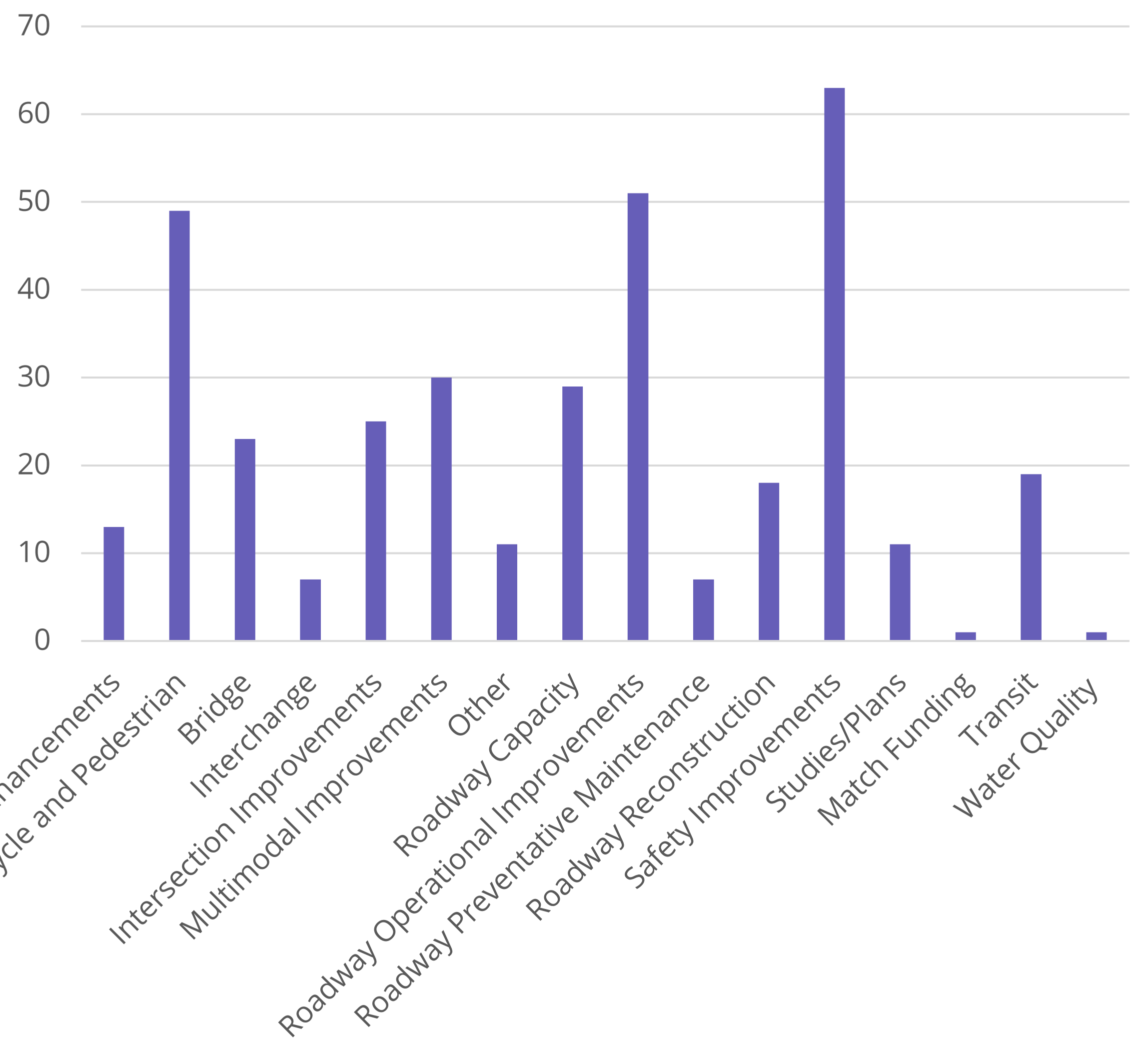


Figure 22: Chart of the number of 2050 LRTP transportation projects by type

The first two goals of the LRTP focus on preserving and enhancing the regional transportation system and ensuring it is efficient and fully connected. To support these goals, nearly 45% of the fiscally constrained project list consists of roadway projects, totaling 105 initiatives. Within this category, 22% (51 projects) are classified as roadway operational improvements, 12% (29 projects) address capacity by adding new roads or lanes, and 11% (25 projects) focus on preventative maintenance or reconstruction. Many of these projects also contribute to the system's resiliency and redundancy.

Among the capacity projects, eight are anticipated to be fully or partially funded by private sources. Six are CDOT-led projects, two of which are currently funded or partially funded through the Transportation Improvement Program (TIP), while one represents the construction phase of an existing TIP project. Of the capacity projects sponsored by local jurisdictions or multiple agencies, three are already partially or fully funded in the TIP, one is part of Phase 2 of an ongoing TIP project, and nine have secured PPRTA voter-approved funding. PPACG expects the remaining capacity projects to be prioritized for future PPRTA funding, as they address critical connectivity needs, enhance safety by updating lane configurations, and fulfill other regional priorities.

In addition to roadway initiatives, nearly 14% (32 projects) are classified as interchange or intersection improvements, and 10% (23 projects) focus on bridges.

The LRTP also prioritizes multimodal transportation and creating a robust, equitable, and healthy system. Recognizing the importance of alternate transportation modes, the project selection process included specific funding sources like the state MMOF and federal TAP programs, which target alternate mode projects. Approximately 16% (49 projects) are bicycle and pedestrian initiatives, with another 13% (30 projects) classified as multimodal improvements. Additionally, over 8% (19 projects) are transit projects, though these do not account for separate transit-specific projects funded by FTA or detailed in the Regional Transit Plan. Specialized transportation initiatives are also excluded from this fiscally constrained list.

Safety remains a critical priority, with 27% of all projects categorized as safety improvements, and nearly 6% classified as ADA enhancements.

Around 10% of the project mix (23 projects) cover transportation studies, plans, water quality improvements, technological advancements, or other transportation-related enhancements. One project, which serves as a PPRTA funding pool for local match contributions to state or federal discretionary grants, was not classified into a specific category.

Because most projects have multiple characteristics, classifying and reporting the project types by their allocated funding is also challenging because many projects can draw from multiple funding sources to address their various elements. For instance, a project might use TAP funding for sidewalks while utilizing STBG funding for roadway operational improvements.

Of note for this report, when considering only the primary project type, the 2050 LRTP designates $182 million for bicycle and pedestrian projects and $76 million for multimodal projects. In comparison, the 2045 LRTP allocated $125 million to active transportation projects, which included both bicycle/pedestrian and multimodal initiatives. When accounting for both primary and secondary project types, the funding totals increase significantly, with $414 million allocated to bicycle and pedestrian projects and $708 million to multimodal projects. Additionally, local transit projects included in the fiscally constrained list and the Regional Transit Plan total approximately $1.5 billion, while 69 fewer centerline miles of new roadway construction are in the 2050 LRTP model network compared to 2045.

The 2050 LRTP project mix highlights the dedication of PPACG and its local governments to addressing the diverse needs of the regional transportation system while promoting sustainable travel solutions. When assessed through the 2050 travel model, these projects demonstrate their collective impact in advancing mobility and significantly reducing greenhouse gas emissions, paving the way for a cleaner, more connected future.

4 GHG Results

4.1 Considerations for Reducing GHG

PPACG has been a proactive partner in evaluating and advancing the implementation of the "Rules Governing Statewide Transportation Planning Process and Transportation Planning Regions" (2 CCR 601-22) since its first draft in 2021. Through ongoing collaboration with CDOT, other MPOs, statewide modeling coordination meetings, and the Inter-Agency Consultation Team (IACT), PPACG has worked to help address unforeseen challenges with practical, data-driven solutions.

Along the way, PPACG technical staff have focused on responsibly using taxpayer MMOF dollars to significantly update the travel demand model, while planners have actively engaged with local government stakeholders to prioritize projects that help meet rule requirements and uphold equitable transportation solutions. These collective efforts have led to several key considerations for PPACG meeting the GHG reduction goal.

4.1.1 Regional Transit Plan

A new Regional Transit Plan was developed by Mountain Metro Transit (MMT) in coordination with PPACG planners and concurrently with the 2050 LRTP to address implementation goals for projects funded through both the LRTP and new state transit programs. The Regional Transit Plan outlines 58 projects divided into short-term (20), medium-term (21), and long-term (17) projects. The projects are categorized by the following investment themes:

- Enhanced Transit Corridors (ETC)
- New Fixed Routes
- Innovative Mobility Zones
- Extend Service Span
- Improve Capital Infrastructure
- Improve Existing Route Frequency
- New Crosstown Routes

4.1.1.1 Enhanced Transit Corridors

Two Enhanced Transit Corridor (ETC) projects stand out as prime candidates for near-term advancement, based on both demand and the level of planning already completed or underway. MMT has initiated the process of defining an Enhanced Transit project along Academy Boulevard, which is likely to be the first ETC to move forward from the long-term vision. As the highest ridership corridor in the MMT network, this project has the potential to set a precedent for future ETCs and establish a replicable process for advancing projects to implementation, regardless of the eventual funding source.

The City of Colorado Springs recently completed the Platte Avenue Corridor Study, which identified several potential improvements to Route 5 in the Platte Avenue corridor. While the study did not recommend a specific transit project scope, it can serve as a foundation for MMT and its partners to further define the Platte ETC project in the short term, even if the project's implementation is delayed until the mid-term horizon.

The project team recommends advancing three additional ETC projects after the Academy Boulevard and Platte Avenue corridors: North and South Nevada Avenue and Colorado Avenue. Although the City of Colorado Springs has already studied the North Nevada Avenue corridor, the recommendations from that study should be revisited closer to implementation, with updated corridor conditions and stakeholder engagement to ensure a viable project. Pairing the North Nevada corridor with South Nevada could attract additional outside grant funding by boosting ridership and serving more transit-dependent areas. The Colorado Avenue corridor, already served by MMT's busy Route 3, would complete the east-west ETC spine (along with the Platte Avenue ETC) through central Colorado Springs.

The project team also recommends implementing two additional ETC projects in the long-term phase. The Airport ETC project would connect Downtown Colorado Springs with the Colorado Springs Airport. Until this project is implemented, improvements to Route 37's frequency and span, as well as the South Innovative Mobility Zone, are expected to address transit needs in this area. The Tutt Boulevard ETC would upgrade existing routes and introduce a new Briargate Parkway/Tutt Boulevard local route identified in the implementation phase. Implementation could be phased, with the new local service introduced before upgrading part of the route to an ETC. This corridor is experiencing rapid growth and would benefit from additional time to build ridership and make the necessary connectivity and land use improvements to support a competitive ETC project.

4.1.1.2 Innovative Mobility Zones

Although MMT should conduct a more detailed prioritization before launching its first Innovative Mobility Zone, the project team identifies two promising candidates for an initial launch. The Northeast Mobility Zone would serve a rapidly growing area of Colorado Springs that lacks access to fixed-route transit. This zone would provide valuable data on the transit demand in this part of the community, helping to inform future decisions on new fixed routes. The South Mobility Zone would address an area with expanding industrial jobs, offering another opportunity to test innovative mobility solutions for job centers that are harder to serve with traditional transit.

In the mid-term phase, the plan recommends exploring additional innovative mobility zones in areas experiencing continued growth but not yet ready for fixed-route service, such as the Southeast Zone and the Northgate/Gleneagle Zone. While improvements to fixed-route service frequency and span are being phased in, this phase could also see the implementation of an innovative mobility zone in Central Colorado Springs to further enhance service availability. Depending on the performance of the Northeast Zone, the fixed-route service expansion may prompt adjustments to the zone boundaries to better align with gaps in coverage, or even eliminate the zone entirely.

The final Innovative Mobility Zone, the Northwest Zone, would be implemented in the long term. As other zones are tested and fixed-route services are expanded, some zones may be phased out, or their boundaries may be adjusted to focus resources on areas with the greatest need.

4.1.1.3 Improved Span/Frequency

One of the most promising short-term projects is the expansion of service span on existing routes, particularly on Sunday evenings. This expansion could be achieved with minimal impact on vehicle requirements or the number of operators.

MMT should continue to expand service span during the medium term as vehicle and operator availability allow. If a reliable new funding source is identified, this phase could also include an initial increase in service frequency along routes beyond those identified as ETCs or Crosstown routes.

With the full implementation of the RTP, all routes would be upgraded to at least a 30-minute weekday frequency, with earlier morning and later evening service compared to current schedules, on both weekdays and weekends.

4.1.1.4 Improved Capital Infrastructure

The project team recommends advancing upgrades to the existing Voyager Transit Center in the short term. These upgrades could be incorporated into the Academy Boulevard ETC project, pending the outcome of that study, and would better support the implementation of the I-25/Voyager Express service. In addition to this facility improvement, the short-term implementation period includes a recommendation to launch both a bus stop accessibility/amenity program and a bus speed and reliability program. While initial investments may be limited, establishing a process by which MMT and its partners can systematically improve the passenger experience will provide an important foundation to scale these improvements in future phases of the plan.

Due to the large expansion of fixed-route service in the mid-term phase, the project team has identified several capital projects that would be needed to support the new service. New capital projects include:

- A new transit center at Woodmen Road/Powers Boulevard (near St. Francis Hospital) to serve new local routes along Tutt Blvd and Woodmen Rd.
- A new transit center at Carefree Circle North to connect existing services to new local service along Tutt Boulevard.
- Expansion of the Bus Stop Accessibility/Amenity and Bus Speed and Reliability programs launched during the short-term period
- A new Maintenance Facility to support the expanded bus fleet needed to serve routes launched during this phase and in accordance with expected zero emission vehicle (ZEV) needs as identified in the ZEV Plan

While less pronounced than the medium-term phase, additional capital projects are likely needed to support the remaining projects identified in the long-term horizon. Those include:

- A new transit center near Briargate Parkway and Powers Boulevard to better support network functionality in north/northeast Colorado Springs.

- A new Mobility Hub at Astrozon (near Academy Boulevard and Hancock Expressway) to connect existing services.
- A new Mobility Hub at Innovation Parkway to connect the new Airport ETC to the new Banning Lewis Ranch South route.
- Continuation of the Bus Stop Accessibility/Amenity and Bus Speed and Reliability programs, with the goal to have 100% of bus stops be compliant with the Americans with Disabilities Act (ADA) and to address remaining delay points on local routes that do not receive investment as part of an ETC project.

4.1.1.5 Crosstown Routes

The medium-term implementation phase includes the introduction of two new crosstown routes. The Lake Corridor, which largely replaces the existing Route 4, provides new connections between important job centers near the Broadmoor and south/southeast Colorado Springs. The Union Boulevard Crosstown Corridor combines existing routes 18 and 38 and introduces regular fixed-route service to a part of the region that is currently only served by deviated fixed-route service. This new north-south crosstown route would be anchored by the UC Health Memorial medical center in the north and the Astrozon Boulevard/Hancock Expressway/Academy Boulevard area to the south.

The final crosstown project is the Garden of the Gods Road/Austin Bluffs Parkway corridor. This project would largely replace two existing local routes that would receive frequency/span improvements in the short- and medium-term phases of the plan and depending on a detailed analysis of impacts to vehicle and operator needs could be accelerated through the first phase of systemwide frequency upgrades.

4.1.1.6 New Routes

The medium-term implementation phase includes the majority of the new fixed-route services recommended in the 2050 RTP. However, it is important to note that implementing such a large expansion of MMT's services will require the identification of additional, reliable funding sources beyond the existing system's expected revenue. Most of the new routes in this phase would serve high-growth communities in North and Northeast Colorado Springs, including two new Express routes: one connecting Downtown Colorado Springs to Falcon along US-24, and another linking Downtown Colorado Springs with the Voyager Transit Center along I-25.

The project team recommends implementing the Banning Lewis Ranch South route during the long-term phase, given the expected longer buildout horizon of Banning Lewis Ranch toward US-24 and further south (with the Southeast Zone serving this area in the interim). Additionally, based on long-term growth trends, the team recommends introducing local service between Monument and Voyager Transit Center in the long term. The team also recommends implementing a Garden of the Gods to Manitou Springs circulator in the long-term, following a more thorough study of the benefits and infrastructure needed to operate such a service. Given its focus on serving tourists visiting Manitou Springs and Garden of the Gods Park, this project may be eligible for advancement on a different timeline with unique funding sources that may not be available for other routes in the proposal.

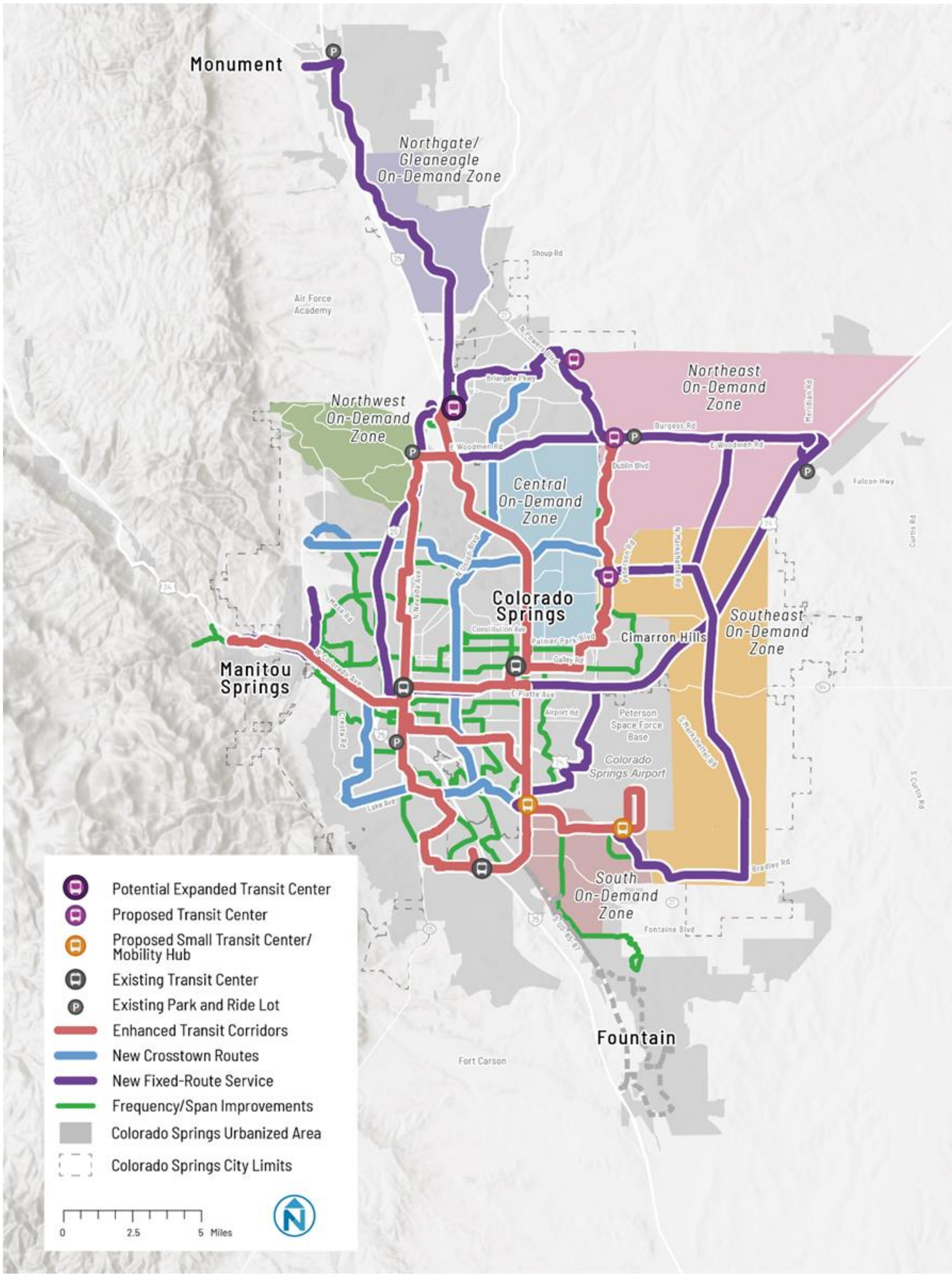


Figure 23: Map of regional transit projects from the transit plan

4.1.2 Transit Connections Study

In 2024, CDOT's Division of Transit and Rail (DTR) launched the Transit Connections Study (TCS) as part of its effort to build a statewide transit network. The study aims to provide a strategic vision for an interconnected statewide transit system, focusing on expanding and improving the Bustang Family of Services, adding passenger rail services, identifying transit gaps and needs, and fostering connections with intercity, regional, and local transit/mobility providers.

Mountain Metro Transit (MMT), local jurisdictions, and CDOT have developed a project list for inclusion in the TCS. This list identifies projects in the Pikes Peak region that align with CDOT's transit goals and represents a more aggressive implementation of the vision laid out in the Regional Transit Plan, designed to leverage increasing funding streams. It includes several service enhancement projects, such as express bus service and localized circulators to address last-mile connections. Additionally, the list features express and flex service as part of the Plains to Peak Corridor, along with several stop and station improvements, including mobility hubs and upgrades to existing connection points. This list is included as an addendum to the Regional Transit Plan.

4.1.3 State Multimodal and Transit Initiatives

Many of the projects and mode choice assumptions incorporated in the Regional Transit Plan and the Transit Connections Study are supported by a host of new state legislation, including:

- SB24-032 Methods to Increase the Use of Transit, provides additional funding for transit in the form of an annual allocation of $7 million to the ozone season transit grant program fund.
- HB24-1152 Accessory Dwelling Units, promotes the development of ADUs, which by extension promotes urban infill and correlates with higher probability of walk, bike, and transit mode choices.
- HB24-1304 Minimum Parking Requirements, prohibits a county or municipality, on or after June 30, 2025, from enforcing minimum parking requirements for real property within a MPO to encourage higher residential density and walk, bike, and transit mode choices.
- HB24-1313 Housing in Transit-Oriented Communities, is intended to provide greater access to transit.
- SB24-184 Support Surface Transportation Infrastructure Development, imposes a $3 a day congestion impact fee on car rentals intended to support the development of Front Range Passenger Rail (FRPR) service.
- SB24-230 Oil & Gas Production Fees, requires the clean transit enterprise to impose a production fee on oil and gas to be used for clean transit.

4.1.4 Modeling the Mode Choice Changes

The 2050 LRTP has more than doubled the funding for transit and multimodal projects compared to the 2045 plan, supported by coordinated planning and programming with local transit providers like MMT and state transit programs run by CDOT, using a host of new funding resources provided by legislation with the explicit goal of promoting multimodal options and transit use. Supporting these initiatives is

PPACG's new travel demand model (TDM), which provides robust capabilities to evaluate the impacts of proposed projects on both transportation efficiency and environmental sustainability.

The following changes were made compared to the 2020 base year model to account for the impacts these initiatives might have on the transportation network. These models constitute what is considered the GHG reduction or action scenarios for each forecast year.

- The transit mode choice probability was increased for general office workers, college students, and individuals over 65 years, for most trip types. This increase in forecasted transit attractiveness as a mode choice also models expected rebound of very low transit boardings in the base year, which likely influenced model calibration.
- In 2030, four new transit routes/lines were added: University of Colorado, Colorado Springs /Colorado College service to downtown, Monument line, Falcon line, and Woodmen line. The North Academy and Voyager lines were coded with shorter 10 minute headway times to reflect planned service improvements.
- In 2040, one new transit line was added: the Union South line. Shorter headways were coded to reflect improved service on the South Academy, Citadel, Union North, and Security Widefield lines.
- In 2050, the FRPR station was added in downtown Colorado Springs with a 30 minute headway service to Denver, and one a new transit line was added to Banning Lewis Ranch. The existing Amazon and Las Vegas transit lines were noticed to not be coded properly to all their stops and were repaired (there was no time to fix this problem in the 2030 and 2040 years before submission), and shorter 15 minute headway service was coded to all routes not already improved in 2030 and 2040.
- Walk mode choice probability for all adults was increased for non-work trips within 2 miles to be more attractive.
- Remote work probability was increased slightly by 4% for office workers and 2% for service workers, for a total remote work probability of around 14%.

	2020		2030		2040		2050	
Auto	1,845,542	*68.87%*	2,028,453	*68.00%*	2,300,422	*68.81%*	2,418,511	*68.05%*
Auto Shared	694,974	*25.93%*	740,937	*24.84%*	825,435	*24.69%*	868,281	*24.43%*
Transit	12,691	*0.47%*	81,389	*2.73%*	83,731	*2.50%*	127,559	*3.59%*
Walk	109,029	*4.07%*	114,512	*3.84%*	113,822	*3.40%*	118,262	*3.33%*
Bike	17,524	*0.65%*	17,757	*0.60%*	19,971	*0.60%*	21,390	*0.60%*
Total Trips	**2,679,761**		**2,983,047**		**3,343,380**		**3,554,003**	

Figure 24: Table of total trips by mode choice in the 2050 LRTP model across all model years

2020		2030		2040		2050	
Static VMT	SBA VMT	Static VMT	SBA VMT	Static VMT	SBA VMT	Static VMT	SBA VMT
14,571,122	**14,672,365**	**15,289,668**	**15,393,629**	**17,415,561**	**17,810,938**	**18,742,536**	**19,472,327**

Figure 25: Table of total vehicle miles traveled (VMT) in the 2050 LRTP model across all model years calculated using both the traditional static assignment and the newer simulation based assignment

4.1.5 New Baseline Model

The GHG rule, "Rules Governing Statewide Transportation Planning Process and Transportation Planning Regions" (2 CCR 601-22), requires that baseline GHG emissions be determined from modeling the regional plan adopted by the MPO when the rule became effective in January 2022. PPACG understood this to mean that the 2045 LRTP travel demand model – being the adopted plan when the rule became effective – would be used to establish the GHG baseline emissions, as its land use and transportation network were utilized to calculate the GHG reduction requirements in Table 1 of the rule. However, in September 2024, CDOT shared their interpretation and instructed PPACG to develop a new baseline model using the 2050 LRTP travel demand model.

PPACG staff and CDOT engaged in several discussions to determine how best to accomplish this, as the 2050 LRTP model represents a substantial improvement over the previous model and includes numerous changes that are incompatible with its predecessor. Some of these challenges include:

- The 2050 model has over 100 new TAZs, with different boundaries and household/employment composition
- Different population and household data, such as income and age brackets, between the models
- The 2045 model uses three worker classes, with no certainty to correctly parse them into the five worker types used in the 2050 model
- The 2045 model network does not have the geometric detail or attributes required for simulation based assignment for 69 centerline miles of major roadway projects removed from the 2050 LRTP

Working closely with CDOT, PPACG used the new 2050 LRTP model to generate a GHG baseline model with the following considerations to the 2045 LRTP:

- The baseline uses the 2045 LRTP land use and population distribution, but scaled to the 2050 LRTP population control total
- The baseline uses the 2050 LRTP workforce and employment distribution
- The baseline reflects the 2045 LRTP model's remote work and mode choice trip distributions
- The baseline contains the 2045 LRTP model's transportation network, using generic intersection geometry adopted where necessary to facilitate simulation based assignment (SBA) and PPACG staff's best estimate for project timelines

While the vehicle miles traveled (VMT) in the new GHG baseline models closely align with the VMT from the adopted 2045 LRTP, the lower average speeds in the baseline models reveal significant congestion in 2040 and 2050, to the point that not all trips in the baseline could be modeled to completion in those years. This is primarily attributed to the conflicting land use forecasts and the transportation project mix adopted in the 2045 LRTP. In retrospect, the nonsynchronous nature of the 2045 plan is apparent; however, it's important to note that as the Pikes Peak Area MPO is in attainment, previous plans did not have emissions budgets. Consequently, previous plans often employed a broader and less constricted approach conducive to their ability to be easily revised in four years' time. The lack of project implementation timelines in previous plans can be considered an example of this approach.

	2030	2040	2045
VMT in the 2045 LRTP for the MPO	16,800,165	18,120,837	18,319,508

	2030	2040	2050
VMT in the new GHG Baseline for the MPO	16,470,841	18,170,984	18,841,427

GHG Baseline Model Avg Speeds

	2030	2040	2050	PM rush hour (4pm - 7pm): 2040	PM rush hour (4pm - 7pm): 2050
Interstate	69.5 mph	56.5 mph	55.2 mph	38.1 mph	37.1 mph
Highways	48.0 mph	36.7 mph	36.5 mph	22.0 mph	23.5 mph
Principal Arterials	38.6 mph	30.2 mph	29.6 mph	18.5 mph	18.4 mph
Minor Arterials	34.9 mph	28.7 mph	27.5 mph	19.8 mph	17.8 mph
Major Collectors	29.3 mph	25.0 mph	24.0 mph	18.7 mph	17.1 mph
Minor Collectors	24.7 mph	23.6 mph	23.6 mph	22.7 mph	22.9 mph

GHG Reduction Scenario Model Avg Speeds

	2030	2040	2050	PM rush hour (4pm - 7pm): 2040	PM rush hour (4pm - 7pm): 2050
Interstate	69.2 mph	68.8 mph	68.5 mph	67.7 mph	66.3 mph
Highways	48.5 mph	48.3 mph	47.5 mph	47.3 mph	45.0 mph
Principal Arterials	38.6 mph	38.3 mph	38.3 mph	37.7 mph	37.4 mph
Minor Arterials	34.9 mph	34.9 mph	34.8 mph	34.7 mph	34.4 mph
Major Collectors	29.3 mph	29.2 mph	29.2 mph	29.0 mph	28.9 mph
Minor Collectors	24.2 mph	24.2 mph	24.2 mph	24.1 mph	24.1 mph

Figure 26: Tables of VMT in the original 2045 LRTP model and the new GHG baseline model, and comparisons of average vehicle speeds in the GHG baseline model and the 2050 LRTP model

The baseline models underscore the substantial benefits achievable through a harmonious land use and transportation planning strategy, such as the approach implemented in the 2050 Long Range Transportation Plan. This recent planning effort has yielded more than just a transportation project list and land use forecast; it has been the impetus to establish two new regional forums that enhance collaboration among local government planners. These forums represent a significant step forward, fostering the collective vision and coordination needed to drive meaningful, positive change across the region, and will help ensure the progress made on the 2050 LRTP continues into the next plan.

4.2 GHG Target Reporting

For each compliance year required under the rule, PPACG provided two sets of Excel file outputs from its travel demand model to the Air Pollution Control Division (APCD) of the Colorado Department of Public Health and Environment (CDPHE) for greenhouse gas (GHG) emissions evaluation using the MOtor Vehicle Emission Simulator (MOVES). These files were also supplied to CDOT, and included hourly traffic volumes, hourly average speeds, and details such as functional class, urban classification, number of lanes, and speed limits for each traffic link within the MPO network. The first file output was from the GHG baseline model derived from the adopted 2045 plan's land use and network, while the second file output was from the GHG action/reduction model from the new 2050 plan.

The result of the emissions analysis done by the APCD using the MOVES tool in rates mode to evaluate PPACG's 2050 LRTP through its travel demand model outputs in the following compliance years for Carbon Dioxide equivalent (CO2e) GHG emissions are as follows:

MPO	Year	pollutantID	HPMSid	Total(tons)
ppacog2030GHGbase	2030	98	11	11.69
ppacog2030GHGbase	2030	98	21	2,127.58
ppacog2030GHGbase	2030	98	30	3,049.30
ppacog2030GHGbase	2030	98	40	25.49
ppacog2030GHGbase	2030	98	50	65.56
ppacog2030GHGbase	2030	98	60	336.82
				5,616.44

MPO	Year	pollutantID	HPMSid	Total(tons)
ppacog2030GHGaction	2030	98	11	10.63
ppacog2030GHGaction	2030	98	21	1,679.36
ppacog2030GHGaction	2030	98	30	2,467.42
ppacog2030GHGaction	2030	98	40	20.92
ppacog2030GHGaction	2030	98	50	51.02
ppacog2030GHGaction	2030	98	60	266.38
				4,495.73

MPO	Year	pollutantID	HPMSid	Total(tons)
PPACOG_2040base	2040	98	11	19.49
PPACOG_2040base	2040	98	21	1,470.33
PPACOG_2040base	2040	98	30	4,743.79
PPACOG_2040base	2040	98	40	35.63
PPACOG_2040base	2040	98	50	95.48
PPACOG_2040base	2040	98	60	438.14
				6,802.86

MPO	Year	pollutantID	HPMSid	Total(tons)
PPACOG_2040action	2040	98	11	12.48
PPACOG_2040action	2040	98	21	620.73
PPACOG_2040action	2040	98	30	2,089.30
PPACOG_2040action	2040	98	40	22.35
PPACOG_2040action	2040	98	50	56.23
PPACOG_2040action	2040	98	60	275.80
				3,076.89

MPO	Year	pollutantID	HPMSid	Total(tons)
PPACOG_2050base	2050	98	11	21.76
PPACOG_2050base	2050	98	21	233.90
PPACOG_2050base	2050	98	30	2,970.43
PPACOG_2050base	2050	98	40	38.80
PPACOG_2050base	2050	98	50	105.67
PPACOG_2050base	2050	98	60	483.41
				3,853.97

MPO	Year	pollutantID	HPMSid	Total(tons)
PPACOG_2050action	2050	98	11	14.26
PPACOG_2050action	2050	98	21	98.60
PPACOG_2050action	2050	98	30	1,306.47
PPACOG_2050action	2050	98	40	24.55
PPACOG_2050action	2050	98	50	61.02
PPACOG_2050action	2050	98	60	295.38
				1,800.28

	2030	**2040**	**2050**
GHG Baseline Model	1.72	2.09	1.18
2050 Plan Action/Reduction Model	1.38	0.94	.55
Reduction Amount	.34	1.15	.63
Required Reduction in the Rule	.15	.12	.07
Pass/Fail	Pass	Pass	Pass

These values reported in Million Metric Tons (MMT) of CO2e emissions

Figure 27: Tables comparing GHG baseline emissions and action/reduction scenario emissions

5 Appendices

5.1 Acronyms and Abbreviations

ADA	Americans with Disabilities Act of 1990
ADU	Accessory Dwelling Unit
APCD	Air Pollution Control Division
CAC	community advisory committee
CCR	Code of Colorado Regulations
CDOT	Colorado Department of Transportation
CDPHE	Colorado Department of Public Health and Environment
CRP	Carbon Reduction Program
CO2e	carbon dioxide equivalent
COG	Council of Governments
BRT	Bus Rapid Transit
EV	electric vehicle
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
FY	fiscal year
GHG	greenhouse gas
GIS	geographic information systems
IACT	Inter-Agency Consultation Team
IGA	Intergovernmental Agreement
LRTP	long range transportation plan
mi	miles
MMOF	multimodal transportation and mitigation options fund
MMT	Mountain Metropolitan Transit
MMT	millions of metric tons
MOVES	MOtor Vehicle Emission Simulator
MPO	metropolitan planning organization
mph	miles per hour
PPACG	Pikes Peak Area Council of Governments
SB	Senate Bill
SBA	simulation based assignment
STBG	surface transportation block grant
TAC	transportation advisory committee
TAP	Transportation Alternatives Program
TAZ	transportation analysis zone
TC	Transportation Commission
TDM	travel demand model
TIP	transportation improvement program

UZA	Census designated urbanized area
VMT	vehicle miles traveled
ZEV	zero emission vehicle

5.2 TDM Calibration and Validation Report

The travel model calibration and validation report developed by the PTV Group as part of its 2050 LRTP travel model improvements is attached.

5.3 MOVES Modeling Methodology Memo

The methodology used by the APCD to calculate greenhouse gas emissions for the PPACG 2050 LRTP travel demand model using the MOVES emissions model is attached.

Pikes Peak Travel Demand Model Update

PTV Group in cooperation with the Pikes Peak Area Council of Governments updated the multimodal tour-based travel demand model that represents travel activity in the region. This model update also enhanced the model with the addition of a work from home variable in the tour generation step and a 24hr dynamic traffic assignment model. The dynamic assignment model is a regional scale mesoscopic traffic simulation with more than 700 signalized intersections. The base year for the model is set to 2020.

This transportation planning model is a tour-based model and is a representation of the Colorado Springs area transportation facilities and multimodal travel patterns using these facilities. The model contains inventories of the existing roadway facilities, transit lines, synthetically generation population at the household and person level, as well as land use data such as workers, student enrollment, shopping, employment etc. in the area. The travel demand model was calibrated to reflect average daily traffic on roadway facilities. Further, hourly traffic counts were used to calibrate hourly travel demand for the purpose of dynamic traffic assignment.

The model can be used to measure the impact and evaluate scenarios such as changes in population, employment centers, travel behavior patterns, or roadway improvements. The transportation engineer or planner, using the transportation planning model, can project future traffic volumes without the cost of building inappropriate roadways or waiting for traffic congestion to severely impact travelers.

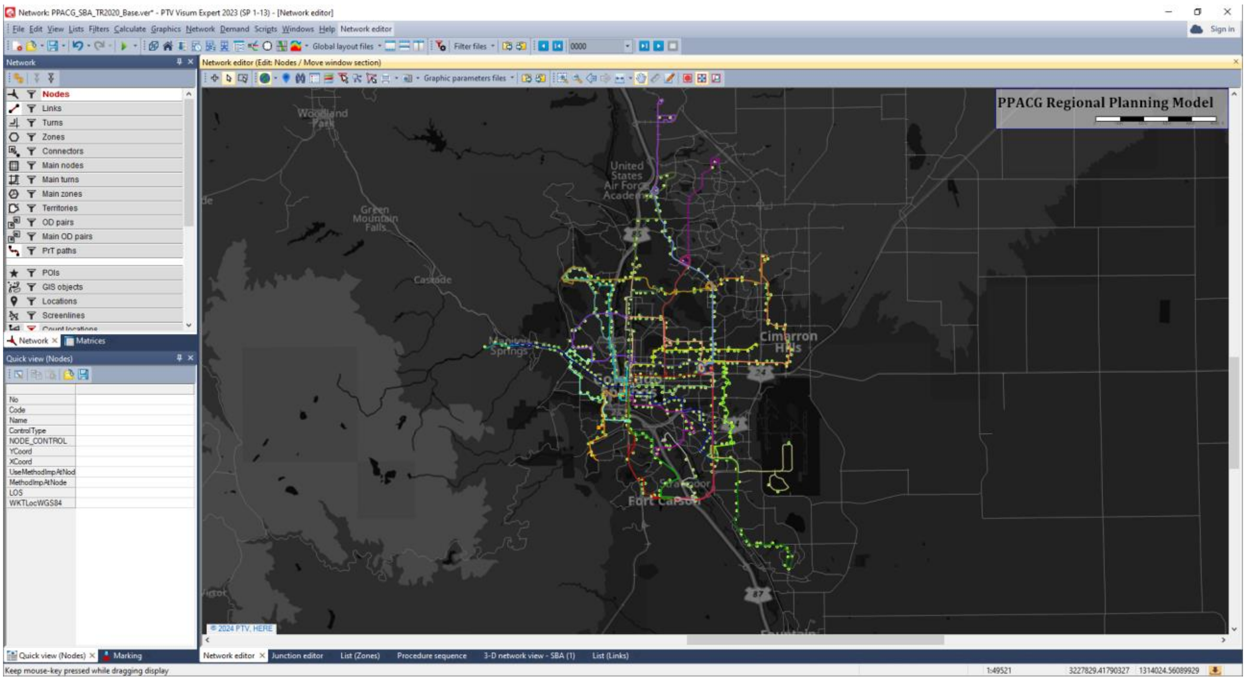
The model was developed using VISUM 2024. VISUM is a Windows based multimodal transportation modeling software and has an array of features implemented in an easy-to-use graphical user interface, thereby making it a very powerful analysis tool for transportation modeling and planning.

This document details the methodology that was used to develop the model. Because modeling is a complex process, much of the theory, terminology, and concepts are also discussed.

1. Model Area Identification

The model area contains El Paso County, Colorado Springs, Manitou Springs, Woodland Park, Green Mountain Falls, Fountain, Palmer Lake and Monument. The major through route in the area is I-25. The route runs in a north-south direction, with Denver in the north and Pueblo in the south. A snapshot of the model area is shown in Figure 1

Figure 1: Travel Demand Model Area – Pikes Peak Area Model



2. *Network Development*

The updated model network is multi-resolution in structure. Here, the level of detail used in the network assignments can be increased or decreased based on the network assignment method. The static assignment uses a typical link-node structure and applies turn prohibitions and macroscopic volume delay functions to model volume-based network delay. The simulation-based assignment (SBA) uses intersection geometry details and intersection control including signal timings and stop/yield control.

Network development for the model involved the following items:

1) Street network development – lanes, speeds, intersection geometries, signal timings etc.
2) Transit network development – transit lines with related timetable and headway data.
3) Transportation analysis zone refinement and updated centroid connectors.

2.1 Street Network Development

The street network for the model was developed by refinement of the existing travel demand model network using GIS layers and aerial imagery. The roadway classes, speeds, capacities and number of lanes were checked and updated in the entire network. In addition, intersection control, geometry and signal timings were added to the network to represent intersection level delay more accurately for the purpose of dynamic traffic assignment.

The following roadway functional classifications were used for modeling link delays in the model:

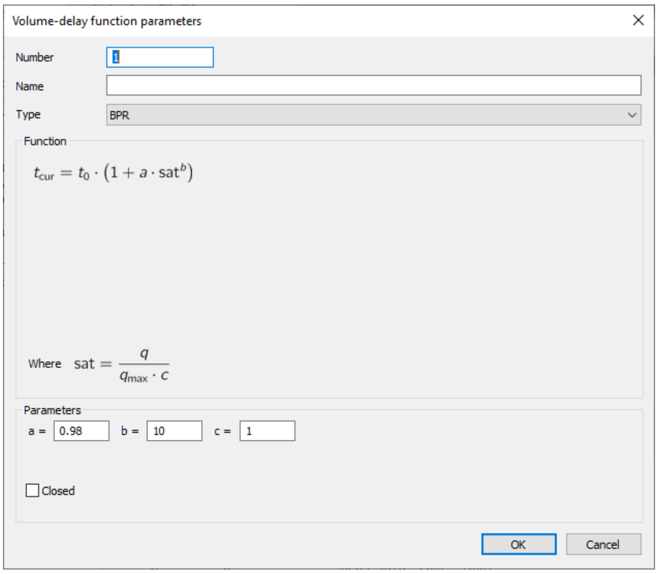
Table 1: Model Link Classification

Type No	Class No	Class Name	Capacity (/hr/ln)	Speed	Delay Function
10	1	Interstate HOV Connection	1500	65	1
11	1	Interstate	2400	80	1
12	1	Interstate	2400	75	1
13	1	Interstate	2400	70	1
14	1	Interstate	2350	65	1
15	1	Interstate	2300	60	1
16	1	Interstate	2250	55	2
17	1	Interstate HOV	1500	75	1
18	1	Interstate HOV	1500	70	1
19	1	Interstate HOV	1500	65	2
20	2	Expressway	2000	65	3
21	2	Expressway	2000	60	3
22	2	Expressway	1850	55	4
23	2	Expressway	1700	50	4
24	2	Expressway	1550	45	4
25	2	Expressway	1500	40	5
26	2	Expressway	1450	35	8
27	2	Expressway	1400	30	9
28	2	Expressway	1350	25	10
29	2	Expressway	1850	70	1
30	3	Principal Arterial	1800	65	4
31	3	Principal Arterial	1800	60	4
32	3	Principal Arterial	1800	55	5
33	3	Principal Arterial	1200	50	5
34	3	Principal Arterial	1000	45	6
35	3	Principal Arterial	900	40	7
36	3	Principal Arterial	850	35	8
37	3	Principal Arterial	800	30	9
38	3	Principal Arterial	800	25	10
40	4	Minor Arterial	1000	55	4
41	4	Minor Arterial	1000	50	5
42	4	Minor Arterial	850	45	6
43	4	Minor Arterial	850	40	7
44	4	Minor Arterial	750	35	8
45	4	Minor Arterial	700	30	9
46	4	Minor Arterial	700	25	10
47	4	Minor Arterial	650	20	10
48	4	Minor Arterial	650	15	10

Type No	Class No	Class Name	Capacity (/hr/ln)	Speed	Delay Function
49	4	Minor Arterial	1000	65	1
50	5	Collector	850	55	5
51	5	Collector	850	50	5
52	5	Collector	650	45	6
53	5	Collector	650	40	7
54	5	Collector	650	35	8
55	5	Collector	650	30	9
56	5	Collector	650	25	10
57	5	Collector	600	20	11
58	5	Collector	600	15	11
59	5	Collector	600	10	11
60	6	Residential	600	35	8
61	6	Residential	600	30	9
62	6	Residential	550	25	10
63	6	Residential	550	20	11
70	7	Ramp	1250	60	3
71	7	Ramp	1200	55	4
72	7	Ramp	1200	50	5
73	7	Ramp	1200	45	6
74	7	Ramp	1200	40	7
75	7	Ramp	1200	35	8
76	7	Ramp	1000	30	9
77	7	Ramp	1000	25	10
78	7	Ramp	1000	20	11
79	7	Ramp	1000	15	12

The above link capacities were applied in the network in combination with BPR volume delay functions to capture volume to capacity-based delay. The functional form is shown in the Figure 2 below.

Figure 2: Link Volume Delay Function for the PPACG Model



Six parameter sets were used in the model. These are shown in the table below:

Table 2: BPR Volume Delay Function Parameters

Delay Function No	BPR_a	BPR_b
1	0.98	10.0
2	0.93	8.0
3	1.00	5.4
4	0.83	2.7
5	0.71	2.1
6	0.15	7.0
7	0.15	7.0
8	0.15	7.0
9	0.15	7.0
10	0.15	7.0
11	0.15	7.0
12	0.15	7.0
13	0.15	7.0

2.2 Transit Network Development

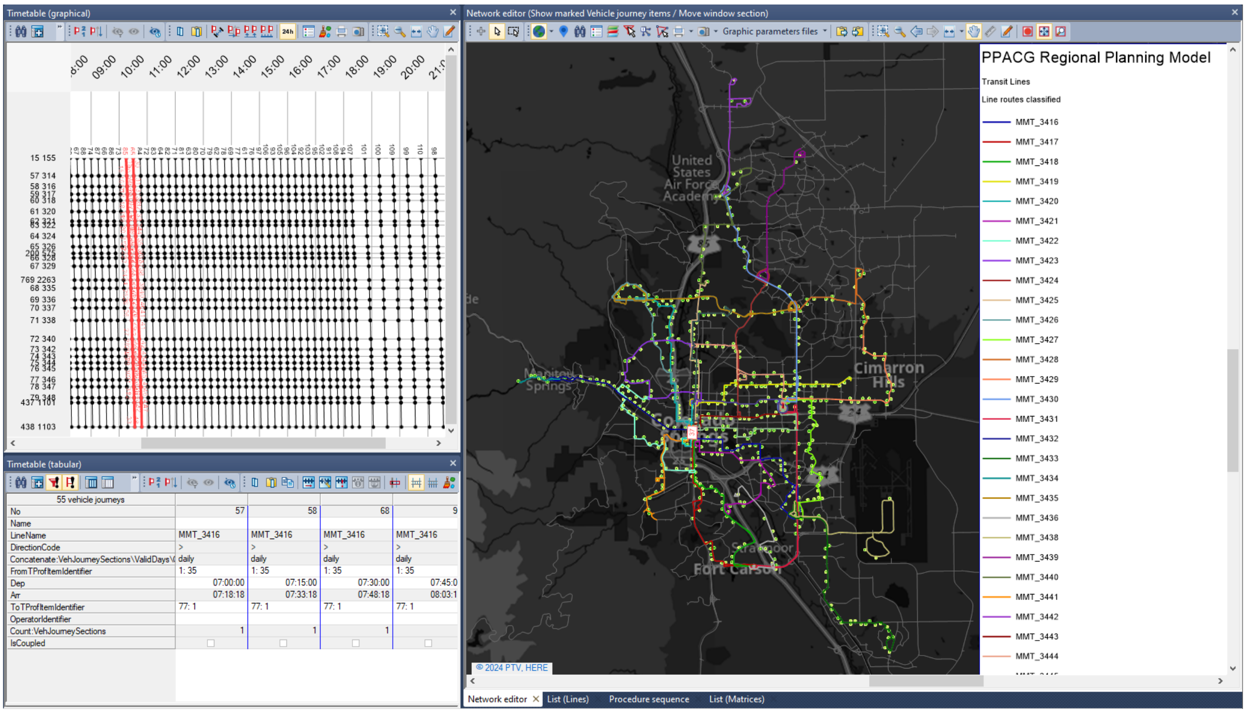
The PPACG tour-based model is designed as a 24-hour model with user defined time of day outputs. As a result, the network from the previous version of the model was completely replaced with a high-resolution transit network based on General Transit Feed Specification (GTFS). This network contains detailed timetable information suitable for timetable-based assignment and other operational analyses related to transit. While the existing model does not use timetable-based transit assignment, storing a timetable allows calculation of transit isochrones by time of day. This is useful in obtaining more realistic measures of transit accessibility and timed transfer connections at a disaggregated level.

A summary of transit lines included in the base model is presented in the table below.

Table 3: Base Model Transit Lines

LINE NAME	ROUTE_ID	ROUTE_NAME	TSYSNAME
MMT_3416	1	Hillside - Hancock Plaza	Bus
MMT_3417	10	Hwy 115 - PPSC	Bus
MMT_3418	11	World Arena - PPSC	Bus
MMT_3419	12	Palmer Park Blvd	Bus
MMT_3420	14	Chestnut St - G.O.G. Rd	Bus
MMT_3421	15	FOUNTAIN BLVD -E CHEYENNE MTN BLVD	Bus
MMT_3422	16	Brookside - Uintah Gardens	Bus
MMT_3423	17	19TH STREET/FILLMORE	Bus
MMT_3424	18	Union Blvd	Bus
MMT_3425	19	WEBER - EAGLE ROCK	Bus
MMT_3426	2	CENTENNIAL BLVD - G.O.G. Rd	Bus
MMT_3427	22	SOUTHBOROUGH VIA MURRAY BLVD	Bus
MMT_3428	23	Barnes Rd. - Tutt Blvd	Bus
MMT_3429	24	Galley Rd - Tutt Blvd	Bus
MMT_3430	25	N. ACADEMY BLVD - VOYAGER	Bus
MMT_3431	27	S. ACADEMY BLVD - PPSC	Bus
MMT_3432	3	COLORADO AVE - MANITOU	Bus
MMT_3433	32	SECURITY/WIDEFIELD	Bus
MMT_3434	33	INCLINE/COG SHUTTLE	Bus
MMT_3435	34	GOG/AUSTIN BLUFFS PKWY	Bus
MMT_3436	35	LAS VEGAS ST/ PPSC	Bus
MMT_3438	37	Amazon/ Airport	Bus
MMT_3439	38	UNION/ CHILDRENS HOSPITAL	Bus
MMT_3440	39	CORPORATE DR - VOYAGER PKWY	Bus
MMT_3441	4	S. 8th STREET - BROADMOOR	Bus
MMT_3442	40	VOYAGER - RAMPART PPSC	Bus
MMT_3443	5	Boulder - Citadel	Bus
MMT_3444	6	FILLMORE - Citadel	Bus
MMT_3445	7	Pikes Peak Ave. - Citadel	Bus
MMT_3446	8	Cache La Poudre - Citadel	Bus
MMT_3447	9	NEVADA - UCCS	Bus
MMT_3448	ZEB	ZEB Downtown Shuttle	Bus

Figure 3: GTFS Based Transit Network for the PPACG Model



2.3 Transportation Analysis Zone Refinement

The original TAZ system for the PPACG model was reviewed and revised to better align with census boundaries and roadway infrastructure. The updated TAZ system consists of 945 zones out of which 11 zones are external stations. The traffic and transit loading points or connectors were also redefined and placed as appropriate. The same loading scheme is used in both static and dynamic network assignments. The updated TAZ system for the PPACG Tour Based Model is illustrated below.

Figure 4: Updated TAZ System for the PPACG Model

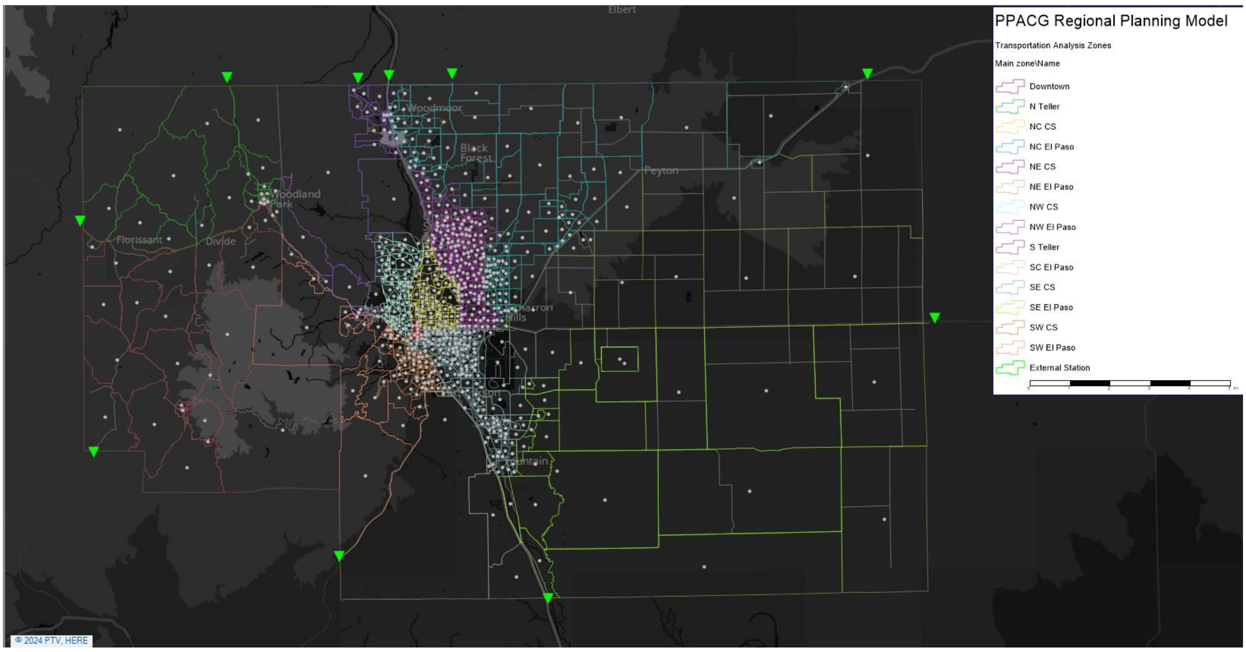


Table 4: PPACG TAZ System Summary

District	Number of Zones
Downtown	72
N Teller	19
NC CS	100
NC El Paso	129
NE CS	182
NE El Paso	14
NW CS	79
NW El Paso	22
S Teller	26
SC El Paso	8
SE CS	183
SE El Paso	23
SW CS	62
SW El Paso	15
External Station	11
TOTAL	**945**

2.4 Land Use Data

The land use and demographic data for the tour-based model was developed from multiple sources. The MPO provided the population and employment cross-sections. Additionally, the land use data related to zone level employment, shopping, recreation and student enrollment was derived from GIS data maintained by the MPO.

2.5 Demographic Data – Population Synthesis

The PPACG model uses a disaggregate synthetic population. The population synthesis process generates household weights for the seed sample that satisfies the marginal distributions. The final weights are then used to expand the seed sample into a disaggregate synthetic population. The use of a synthetic population allows greater flexibility in modeling tour and trip making characteristics by various demographic cross-sections and incorporation of variables to model work-from-home situations in a more robust and flexible manner.

With the advancement of travel demand models in recent years, synthetic population generation has also received research attention. Traditional population synthesizers used Iterative Proportional Fitting (IPF) or Iterative Proportional Updating (IPU) methods while advanced population synthesizers use optimization-based techniques such as entropy maximization and linear programming. PopulationSim[1] is a state-of-the-art population synthesizer software originally developed for the Oregon Department of Transportation (ODOT) and its partner agencies. PopulationSim is an open software developed in the ActivitySim[2] framework and is currently managed by the ActivitySim consortium. PopulationSim offers many technical and usability enhancements over other population synthesizers.

[1] PopulationSim: https://activitysim.github.io/populationsim/
[2] ActivitySim: https://activitysim.github.io/

PopulationSim makes several advancements over traditional population synthesizers such as PopSyn3 and PopGen. These include enhancements resulting from the use of advanced optimization methods, unique features for travel demand model applications, efficient software design, and better interfacing with PTV Visum. The following sub-sections describe these benefits in more detail.

Algorithmic advantages

PopulationSim uses an entropy maximization-based list-balancing approach for generating weights[3]. The entropy-maximization formulation results in uniform weights that are not expanded beyond a user-defined threshold. The uniformity in weights ensures that the distribution of uncontrolled variables is not significantly changed in the process. This unique formulation also allows for the specification of importance factors on each marginal control. The user can set these factors in accordance with their confidence in the quality of the data.

Another important advantage of the PopulationSim algorithm is that it operates simultaneously on all geographic units. This eliminates the errors resulting from the sequential processing of geographies. This is a known problem in the PopSyn3 population synthesizer which results in poor control match for minority population segments such as university students or low-income households. The simultaneous list balancing method used in PopulationSim eliminates this type of error and results in better control match for minority population segments.

Generally, the list balancing or IPF-based process generates floating-point weights. However, for expanding the seed sample, integer weights are required. Many traditional population synthesizers resort to simple or bucket rounding of floating-point weights. This method results in poor control matches and the errors can accumulate over geographic units. Some IPF-based population synthesizers such as PopGen rely on Monte-Carlo draws from a joint distribution of floating-point weights. Again, the Monte-Carlo errors can accumulate and result in poor marginal control matches. PopulationSim uses a linear programming (LP) formulation to convert floating-point weights to integers. As a result, PopulationSim avoids rounding or drawing errors in contrast to other population synthesizers.

Advanced usability features

PopulationSim also offers several unique features that make it a practical choice for many travel demand model applications. These features are described below:

- Person controls

PopulationSim allows the specification of both household and person-level controls. While most population synthesizers offer this feature, some of the traditional ones operate only at the household level.

- Multiple geographies

As stated earlier, the main inputs to the population synthesis process are a seed sample and marginal controls. Typically, most population synthesizers operate at a single geographic level. However, data for marginal controls are generally not available at the same geographic level. For example, the household income distributions may be available at the Traffic Analysis Zone (TAZ) level and the person age distribution might be available at the County level. The available data needs to be transformed to the

[3] See TRB Paper for more details:
https://github.com/ActivitySim/populationsim/blob/master/papers/TRB_Paper_PopulationSim_v6.pdf

same geographic level which can be a time-consuming task and can introduce approximation errors. In contrast, PopulationSim can use data available at multiple geographic levels without any transformation.

- Importance factors for controls

As stated earlier, PopulationSim also allows users to specify importance factors on each control. The PopulationSim algorithm gives higher priority to marginal controls with a higher importance factor. This feature can be very useful in a situation where the user places a higher level of confidence in a certain data source.

- Re-populate feature

Typical model applications for a regional model include corridor studies and traffic impact studies, which require carefully controlled baseline versus build analysis. PopulationSim software offers functionality that supports this type of analysis; a 're-populate' mode in the software adds to or replaces the existing synthetic population in a subset of zones using whatever controls the user is able to provide (for example, households by type).

Software benefits

As mentioned earlier, PopulationSim has a robust open-source software implementation in the ActivitySim framework. Software development adheres to software engineering best practices. The system is under continuous integration (CI), which means the software and documentation are automatically built and tested against sample datasets to ensure that new features do not break the code base for any users. PopulationSim benefits arising from its robust software design are described below:

- Runtime

The Python-based ActivitySim framework makes heavy use of the Numpy and Pandas Python libraries, which allow for the vectorization of operations to reduce overall runtime. This in conjunction with an optimization-based algorithm achieves faster convergence for PopulationSim. Runtime comparison between PopGen and PopulationSim for DVRPC and NFTPO showed significant runtime improvements.

- ActivitySim framework

The software depends on the ActivitySim core and therefore offers the same user experience as the ActivitySim activity-based model, namely the same user interface, customizable expressions, approach to tracing calculations, and data management.

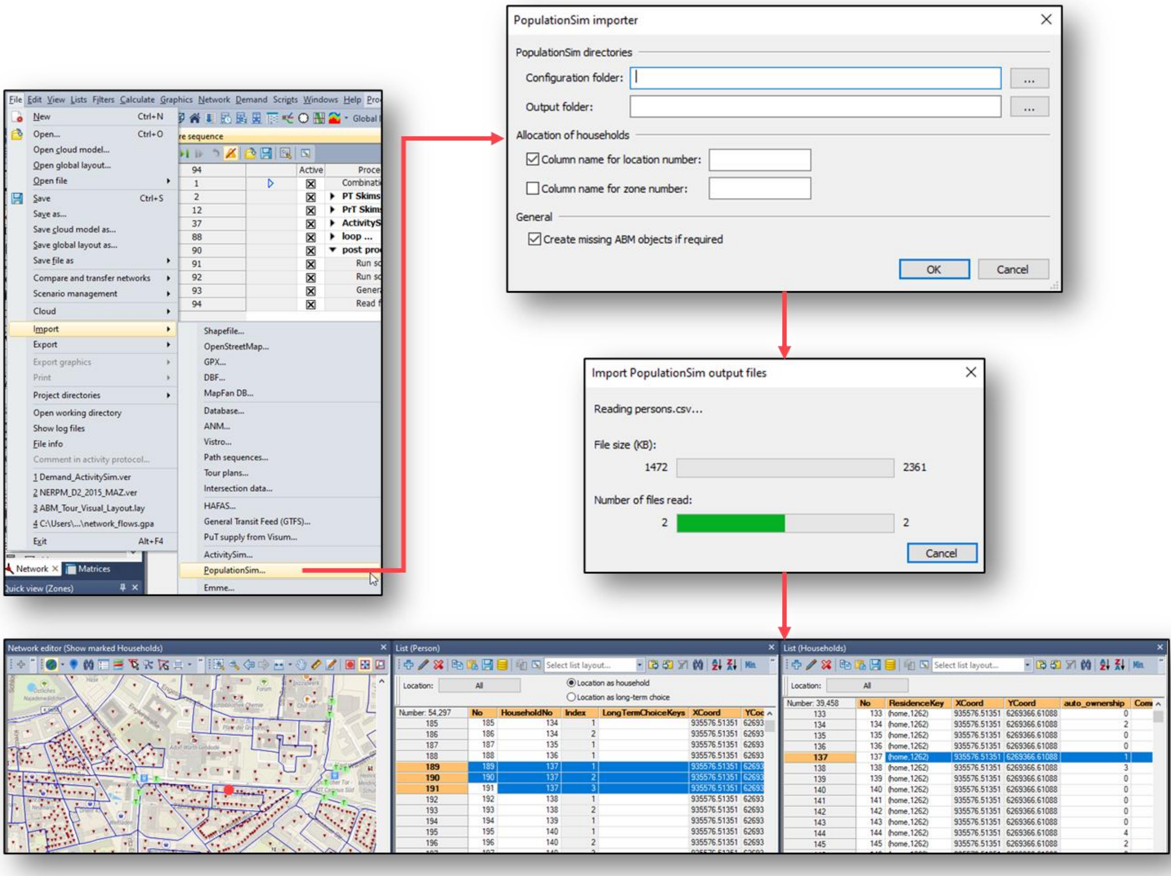
- Documentation and support

The PopulationSim source code and technical documentation are available at the following public GitHub repository: https://github.com/ActivitySim/populationsim. The technical documentation includes runnable examples and training resources. PopulationSim enjoys a large user community in the US and worldwide. The users can report bugs and issues on the GitHub repository and contribute to the software development.

Integration with PTV Visum

Visum now includes person and household Network Objects to house synthetic populations. Visum's Python API or the GUI-based menu option can be used to import PopulationSim-generated synthetic population. The user points Visum to an existing PopulationSim setup. The import procedure reads the outputs into Visum and creates network objects as needed.

Figure 5: PTV Visum PopulationSim Import Procedure



The list of land use and demographic variables used in the model is given in the Appendix.

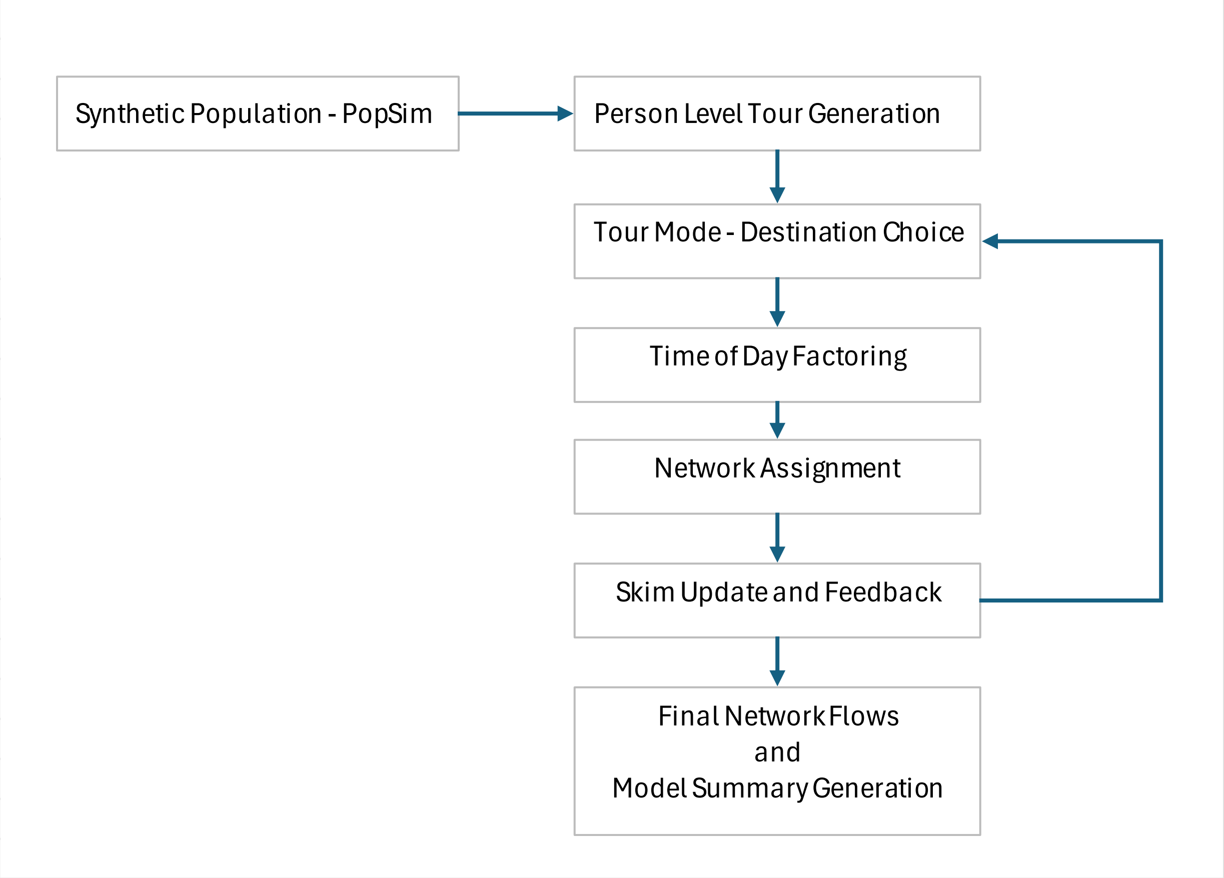
3. Model Approach

The tour-based model structure adopted in Visum is based on a hybrid modeling methodology which explicitly models person tour generation at the individual level and combined mode-destination and time of day choice of homogeneously divided person types at an aggregated zonal level. It involves execution of the following procedures:

1) Tour generation
2) Tour destination choice – with and without rubber banding
3) Tour mode choice – with primary mode choice or leg-by-leg mode choice
4) Time of day calculation – based on trip level time of day factors derived from survey data

The three logical units (mode-destination-time of day choice) are processed simultaneously during the model calculation.

Figure 6: PPACG Tour Based Model Calculation Flow



3.1 Tour Generation

Tour generation (calculating and applying skeletal tour/activity patterns by person type): In the hybrid modeling approach, tour generation is calculated at the person level using a range of person and household attributes. Subsequently, the person level results are aggregated into a set of broader person groups which are used to summarize model results and application of mode-destination and time of day models.

Table 5: PPACG Model Person Groups

CODE	NAME
Worker_GCP	General, Clerical and Professional Workers
Worker_MCT	Manufacturing, Construction and Trades Workers
Worker_MIL	Military Workers

NonWorker	Non-Workers under 65
Senior	Non-Workers 65 and above
Student_Elem	Student Elementary School
Student_High	Student High School
Student_Univ	Student College University

The updated tour generation model incorporates a work-from-home model to accommodate the impact of new work-from-home trends seen after the COVID19 pandemic. The approach used in the PPACG tour generation model to account for work-from-home policies is applied as a post-processing step in tour generation that scales the base tour generation to produce updated tour frequencies for each worker in the synthetic population.

In the first step, a mobility rate is calculated for each person and tour type combination. To calculate mobility rates, daily activity chains derived from a travel survey are broken down into individual home-based tours. Distinct tour types are identified among the complete set of tours and their corresponding probability is calculated. As a result, the sum of the probabilities of a person group can be greater than 1.0 (or 100 %), because a person can execute multiple tours one after the other in a day (for example: first HWH, then HOH).

Consider for example the daily activity chains 5 persons below:

HWH, HWH, HWOH, HWHOH, HOHWH

In the above case, mobility rates for home-based tours (HWH, HWOH, HOH) tours are calculated by counting their occurrence in each of the daily activity chains and dividing it by the total number of daily activity chains.

This produces a mobility rate of 0.8 [4/5] for HWH, a mobility rate of 0.4 [2/5] for HOH and a mobility rate of 0.2 [1/5] for HWOH tours.

Mobility rate extraction from the travel diary coarsely involves the steps below,

1) Extraction of raw chains or daily patterns for each person type

2) Determining unique home-based tours within the chains

3) Counting the occurrence of each tour type in the list of all chains and dividing by the number of activity chains.

The base mobility rates for each person group and tour type derived from the PPACG travel survey are tabulated below. Activities in the tour chain are represented as: H-Home, W-Work, D-Stop on work/school, O-Non-work.

Table 6: Tour Mobility Rates by Person Type

NO	TOUR	WORKER GCP	WORKER MCT	WORKER MIL	NON-WORKER	SENIOR	STUDENT ELEM	STUDENT HIGH	STUDENT UNIV
1	HDDDWDDDH	0	0	0	0	0	0	0	0
2	HDDDWDDH	0	0	0	0	0	0	0	0
3	HDDDWDH	0	0	0	0	0	0	0	0
4	HDDDWH	0.01	0.01	0	0	0	0	0	0
5	HDDSDDH	0	0	0	0	0	0	0.01	0.01
6	HDDSDH	0	0	0	0	0	0	0	0
7	HDDSH	0	0	0	0	0	0	0	0
8	HDDWDDDH	0	0.01	0	0	0	0	0	0
9	HDDWDDH	0	0	0	0	0	0	0	0
10	HDDWDH	0.01	0.01	0	0	0	0	0	0
11	HDDWH	0.01	0	0.01	0	0	0	0	0
12	HDSDDH	0	0	0	0	0	0.01	0	0.01
13	HDSDH	0	0	0	0	0	0.05	0.05	0.01
14	HDSH	0	0	0	0	0	0.03	0.06	0.01
15	HDWDDDH	0.02	0.02	0.02	0	0	0	0	0
16	HDWDDH	0.02	0.01	0.02	0	0	0	0	0
17	HDWDH	0.03	0.01	0.06	0	0	0	0	0
18	HDWH	0.05	0.03	0.04	0	0	0	0	0
19	HOH	0.44	0.41	0.25	0.67	0.55	0.38	0.26	0.44

NO	TOUR	WORKER GCP	WORKER MCT	WORKER MIL	NON-WORKER	SENIOR	STUDENT ELEM	STUDENT HIGH	STUDENT UNIV
20	HOOH	0.16	0.12	0.09	0.26	0.22	0.12	0.05	0.15
21	HOOOH	0.07	0.04	0.03	0.1	0.06	0.04	0.05	0.06
22	HOOOOH	0.09	0.06	0.01	0.11	0.11	0.04	0.03	0.07
23	HSDDH	0	0	0	0	0	0.04	0.1	0.04
24	HSDH	0	0	0	0	0	0.08	0.12	0.03
25	HSH	0	0	0	0	0	0.42	0.5	0.22
26	HWDDDH	0.06	0.05	0.02	0	0	0	0	0
27	HWDDH	0.05	0.05	0.06	0	0	0	0	0
28	HWDH	0.08	0.07	0.07	0	0	0	0	0
29	HWH	0.4	0.5	0.5	0	0	0	0	0

In the second step, a person level work from home multinomial choice model is used to estimate the probability of a person working from home for a given number of days. This provides a scaling factor that is then applied to the 'base' work tour mobility rate for each person. The model coefficients for the telecommute frequency choice model were initially adopted from the SANDAG travel demand model and calibrated to the available remote-work data available in the travel survey. The coefficients adopted in the model are tabulated below.

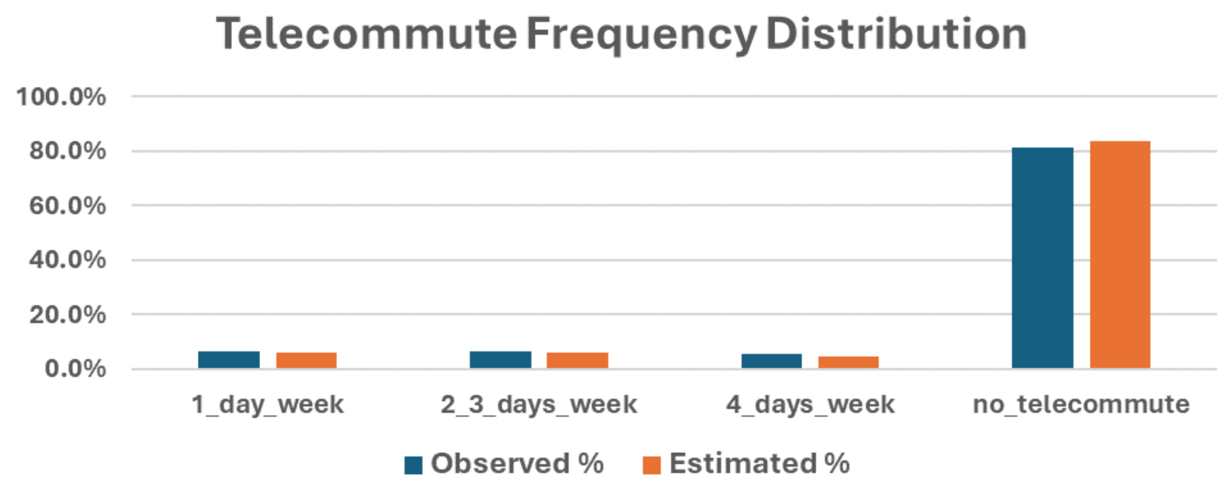
Table 7: Remote Work Choice Model Parameters

		Telecommute Alternative Coefficients			
No	Variable	no_telecommute	1_day_week	2_3_days_week	4_days_week
1	occp_Services	0	-1.62	-0.65	0
2	occp_SalesOffice	0	-0.62	-0.74	-0.89
3	occp_ResourceConstruct	0	-1.57	0	0
4	occp_TransportMat	0	-14.75	0	0
5	presenceOfChildren0_5	0	0	0	-0.86

		Telecommute Alternative Coefficients			
No	**Variable**	**no_telecommute**	**1_day_week**	**2_3_days_week**	**4_days_week**
6	presenceOfChildren6_12	0	0	0.52	-0.81
7	adultInHousehold_1	0	0.18	0	-0.04
8	adultInHousehold_ge2	0	0	0	0
9	female	0	0	0	0
10	partTimeWorker	0	0	0.42	1.11
11	univStudent	0	0	0.6	0
12	paysToPark	0	0.46	0	0
13	income_60_100k	0	0.56	0.39	0
14	income_100_150k	0	0.64	0.19	0
15	income_150k_pl	0	0.92	0.77	0
16	autos_0	0	0	0.41	0
17	autos_1	0	0	0	0
18	autos_ge3	0	0	-0.73	0
19	avgDistToWork	0	0.02	0	0
20	ASC	0	-3.62	-3.55	-4.57
21	CALIB_CONST	0	0.57	0.77	1.65

The framework above allows a flexible way to account for the impact of remote work policies on work related travel. This flexibility in the model is necessary because the remote work policies of employers are still evolving post-pandemic (COVID19). The tour generation mode considers that certain types of workers may not be able to work remotely due to the nature of their job (military, manufacturing, service). The models are thus applied based on workers classified by occupation types rather than income. The summaries for the base model are shown below.

Figure 7: Telecommute Model Validation



Observed	
TelecommuteFreq	Workers
1_day_week	16,052
2_3_days_week	16,903
4_days_week	14,198
no_telecommute	206,952
Total	254,104

Estimated	
TelecommuteFreq	Workers
1_day_week	18,899
2_3_days_week	19,344
4_days_week	14,270
no_telecommute	266,628
Total	319,141

Estimated Scaled	
TelecommuteFreq	Workers
1_day_week	18,899
2_3_days_week	19,344
4_days_week	14,270
no_telecommute	266,628
Total	319,141

Observed %	
TelecommuteFreq	Percent
1_day_week	6.3%
2_3_days_week	6.7%
4_days_week	5.6%
no_telecommute	81.4%
Total	100%

Estimated %	
TelecommuteFreq	Percent
1_day_week	5.9%
2_3_days_week	6.1%
4_days_week	4.5%
no_telecommute	83.5%
Total	100%

Table 8: Summary of Base Year Person Tours

Person Group	Persons	Work/School Tours	Other Tours	Total Tours
Worker_GCP	257,151	179,257	204,696	**383,952**
Worker_MCT	59,428	42,727	39,103	**81,829**
Worker_MIL	22,093	16,766	8,825	**25,591**
NonWorker	112,822	-	129,559	**129,559**
Senior	92,989	-	88,154	**88,154**
Student_Elem	143,255	91,617	84,293	**175,910**
Student_High	47,740	40,155	18,552	**58,706**
Student_Univ	47,864	15,679	34,857	**50,536**

3.2 Tour Based Destination and Mode Choice

Destination choice/trip distribution (determining the trip destination): The hybrid approach used in the PPACG model implements the tour-based destination choice at a zonal aggregate level. Modeling of tours considers non-home-based trips as part of a trip chain. This makes the non-home-based trips spatially consistent with the overall trip making in the system. Aggregate tour or trip chain calculations are implemented with matrix operations in a multi-threaded optimized framework. This removes the burden of complicated matrix management from the modeler. Instead, outputs can be specified by time of day and with a flexible combination of activities and modes.

Figure 8: Tour-based Destination-Mode Choice Output Specification

Parameters: Tour-based model - Combined trip distribution / mode choice

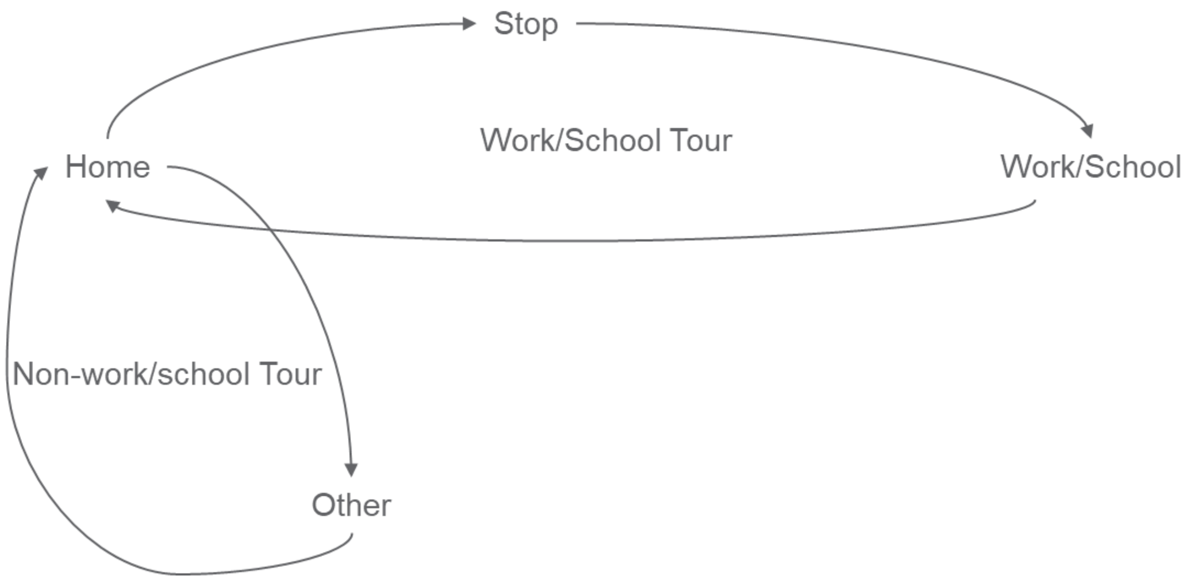
Distribution utility | Mode choice utility | Rubber banding | Output demand matrices | Output path sequences

	Calculate	Person groups	Modes	Origin activities	Destination activities	From time	To time	Type	Output matrix reference	Output matrix
1	☒	Worker_GCP	All	H	W	00:00:00	24:00:00	Other	Matrix(481)	481 HWH_GCP_Calib
2	☒	Worker_GCP	All	H,O	H,O	00:00:00	24:00:00	Other	Matrix(488)	488 Other_GCP_Calib
3	☒	Worker_GCP	All	D,H,W	D	00:00:00	24:00:00	Other	Matrix(497)	497 Stops_D_GCP_Calib
4	☒	Worker_GCP	All	D	H	00:00:00	24:00:00	Other	Matrix(498)	498 Stops_DH_GCP_Calib
5	☒	Worker_GCP	a	All	All	00:00:00	05:00:00	Mode choice matrix	Matrix(311)	311 Worker_Inc1 x a 00:00:00-07:00:00
6	☒	Worker_GCP	as	All	All	00:00:00	05:00:00	Mode choice matrix	Matrix(312)	312 Worker_Inc1 x as 00:00:00-07:00:00
7	☒	Worker_GCP	wb	All	All	00:00:00	05:00:00	Mode choice matrix	Matrix(313)	313 Worker_Inc1 x wb 00:00:00-07:00:00
8	☒	Worker_GCP	a	All	All	05:00:00	10:00:00	Mode choice matrix	Matrix(314)	314 Worker_Inc1 x a 07:00:00-09:00:00
9	☒	Worker_GCP	as	All	All	05:00:00	10:00:00	Mode choice matrix	Matrix(318)	318 Worker_Inc1 x as 07:00:00-09:00:00
10	☒	Worker_GCP	wb	All	All	05:00:00	10:00:00	Mode choice matrix	Matrix(322)	322 Worker_Inc1 x wb 07:00:00-09:00:00
11	☒	Worker_GCP	a	All	All	10:00:00	15:00:00	Mode choice matrix	Matrix(315)	315 Worker_Inc1 x a 09:00:00-16:00:00
12	☒	Worker_GCP	as	All	All	10:00:00	15:00:00	Mode choice matrix	Matrix(319)	319 Worker_Inc1 x as 09:00:00-16:00:00
13	☒	Worker_GCP	wb	All	All	10:00:00	15:00:00	Mode choice matrix	Matrix(323)	323 Worker_Inc1 x wb 09:00:00-16:00:00
14	☒	Worker_GCP	a	All	All	15:00:00	20:00:00	Mode choice matrix	Matrix(316)	316 Worker_Inc1 x a 16:00:00-19:00:00
15	☒	Worker_GCP	as	All	All	15:00:00	20:00:00	Mode choice matrix	Matrix(320)	320 Worker_Inc1 x as 16:00:00-19:00:00
16	☒	Worker_GCP	wb	All	All	15:00:00	20:00:00	Mode choice matrix	Matrix(324)	324 Worker_Inc1 x wb 16:00:00-19:00:00
17	☒	Worker_GCP	a	All	All	20:00:00	24:00:00	Mode choice matrix	Matrix(317)	317 Worker_Inc1 x a 19:00:00-24:00:00
18	☒	Worker_GCP	as	All	All	20:00:00	24:00:00	Mode choice matrix	Matrix(321)	321 Worker_Inc1 x as 19:00:00-24:00:00
19	☒	Worker_GCP	wb	All	All	20:00:00	24:00:00	Mode choice matrix	Matrix(325)	325 Worker_Inc1 x wb 19:00:00-24:00:00
20	☒	Worker_GCP	All	D,H,W	D,H,W	00:00:00	24:00:00	Other	Matrix(512)	512 Trips_GCP_Calib
21	☒	Worker_GCP	a	All	All	00:00:00	24:00:00	Mode choice matrix	Matrix(516)	516 Auto Trips
22	☒	Worker_GCP	as	All	All	00:00:00	24:00:00	Mode choice matrix	Matrix(517)	517 AutoShared Trips
23	☒	Worker_GCP	wb	All	All	00:00:00	24:00:00	Mode choice matrix	Matrix(518)	518 WalkBus Trips
24	☒	Worker_GCP	w	All	All	00:00:00	24:00:00	Mode choice matrix	Matrix(519)	519 Walk Trips
25	☒	Worker_GCP	f	All	All	00:00:00	24:00:00	Mode choice matrix	Matrix(520)	520 Bike Trips
26	☒	Worker_GCP	s	All	All	00:00:00	24:00:00	Mode choice matrix	Matrix(521)	521 School Bus

OK Cancel

The trip chaining within the tours is calculated in two modes – without rubber-banding (full-tours) and with rubber-banding (half-tours). The methodology for trip chain calculation is described in the next subsections.

Figure 9: Example Tour Types



Tours without Primary Activities

The tour-based destination choice is performed using the gravity/destination choice formulation shown below:

$$P_{ij}^{g} = \frac{Z_j . f(U_{ij}^{g})}{\sum_{k=1}^{N} Z_k . f(U_k^{g})}$$

Where,

P_{ij}^{g} *= Probability of destination/location choice.*

$f(U_{ij})$ = friction term with specified functional transformation on utility.

Zj = size term related to the destination activity.

If *$f(U_{ij})$* is used with a logit function, the above equation becomes equivalent to:

$$P_{ij}^{g} = \frac{e^{U_{ij}^{g} + \ln(Z_j)}}{\sum_{k=1}^{N} e^{U_{ik}^{g} + \ln(Z_k)}}$$

Multiplying out the total number of tours with the above probabilities yields the number of trips along the tour leg. Each trip leg of the home-based tour is evaluated by successively applying the above formulation with each destination leg serving as the origin control for the next leg. As an example, a tour with the skeletal structure HOOH, will be calculated as a chain of matrix operations applied to each leg: HO-> OO->OH. The tour generation provides the initial control trip total for the first trip leg.

Tours with Primary Work/School Activities

Work and school tours are modeled using the concept of rubber-banding. Here, a primary destination governs the choice of mode as well as intermediate stop locations on work and school tours. Consider a tour with skeletal structure HSWH (Home-Stop-Work-Home). Since the primary activity in this tour is

Work (W), the chain is split into two half-tours: (1) HSW and (2) WH. The first half-tour HSW is calculated using the attraction size of the work activity as HW. The trips between H and W are then routed through potential stop locations by using the composite utility of the stop attraction size and friction factor of stop locations with respect to the two anchor locations (Home and Work).

Figure 10: Half Tour with Primary Work Destination and Intermediate Stop Location

A general consideration for the insertion of stop locations on primary tours is to minimize out of way travel between the primary activity locations (Home and Work/School). The stop location choice is thus based on the composite utility of the trip legs between the primary anchor locations and stop locations. The formulation for intermediate stop location choice is illustrated below:

$$P_{ik} = \frac{Z_k \times f(U_{ik}^{H\to S} + wU_{kj}^{S\to W})}{\sum_{m=1}^{n} Z_m \times f(U_{im}^{H\to S} + wU_{mj}^{S\to W})}$$

Where,

i=index of origin (home anchor)

j=index of primary destination (work/school)

k=index of intermediate stop location

Zk= size variable for stop location k

f = functional transformation | exp

U(HS), (SW) – utilities of traveling to destination thorough a given stop location

w = weight factor

Destination Choice Model Parameters

The activities considered in the PPACG model are tabulated below:

Activity Name	Activity Code	Anchor Activity
Stop on primary	D	No
Home	H	Yes

Other (Shop/Recreation/Non-work)	O	No
School	S	No
Work	W	No

The size variables used in the model are applied to each person group as a weighted sum of land use variables. The initial set of these weights were based on the SANDAG activity-based model. The weights were then systematically calibrated for the PPACG model to reflect local conditions.

		Land Use Variable												
Person Type	**Activity**	**EMP OFFICE**	**EMP RETAIL**	**EMP SRVC**	**EMP LABOR**	**EMP MIL**	**HH**	**EMENROLL**	**HS ENROLL**	**COLL ENROLL**	**EMP SRVC**	**EMP RETAIL**	**EMP OFFICE**	**EMP SRVC**
Senior/Non-Worker	Other	0	0.95	0.3	0	0	0.07	0	0	0	-0.25	-0.8	0	-0.25
Students	Other	0	0.95	0.3	0	0	0.07	0	0	0	-0.25	-0.85	0	-0.25
Workers	Other	0	0.95	0.3	0	0	0.05	0	0	0	-0.25	-0.8	0	-0.25
Elementary	School	0	0	0	0	0	0	1	0	0	0	0	0	0
High	School	0	0	0	0	0	0	0	1	0	0	0	0	0
Post Secondary	School	0	0	0	0	0	0	0	0	1	0	0	0	0
Workers (GCP/MCT)	Stop	0	0.95	0.3	0	0	0.05	0.1	0	0	-0.25	-0.8	0	-0.25
Workers (MIL)	Stop	0	0.95	0.3	0	0	0.05	0.1	0	0	0	0	0	-0.25
Students	Stop	0	0.95	0.25	0.1	0	0.03	0.05	0	0	-0.2	-0.85	0	-0.23
Workers (GCP)	Work	0.94	0.83	0.93	0.11	0	0	0	0	0	0	0	0	0

		Land Use Variable												
Person Type	Activity	EMP OFFICE	EMP RETAIL	EMP SRVC	EMP LABOR	EMP MIL	HH	EM EN ROL L	HS ENRO LL	COLL ENROL L	EMP SRVC	EMP RETAIL	EMP OFFICE	EMP SRVC
Workers (MCT)	Work	0.06	0.17	0.07	0.89	0	0	0	0	0	0	0	0	0
Workers (MIL)	Work	0	0	0	0	1	0	0	0	0	0	0	0	0

The impedance term in the destination choice model was adopted from the SANDAG model and uses the time, distance and various transformations over destination distance. The coefficients in the model were then systematically calibrated to fit trip length distribution observed from the available travel survey. The impedance related utility coefficients in the model are tabulated below:

Table 9: Impedance Related Utility Coefficients in Destination Choice

Person Type	Activity	Time	Dist	Dist^2	Dist^3	ln(Dist +1)
Worker_GCP	Work	-0.04	0.05	0	0	-0.85
Worker_GCP	Other	-0.21	0.04	0	0	-0.75
Worker_GCP	Stop	-1.4	0	0	0	0
Worker_MCT	Work	-0.04	0.05	0	0	-0.85
Worker_MCT	Other	-0.21	0.04	0	0	-0.75
Worker_MCT	Stop	-1.4	0	0	0	0
Worker_MIL	Work	-0.04	0.05	0	0	-0.85
Worker_MIL	Other	-0.21	0.04	0	0	-0.75
Worker_MIL	Stop	-1.4	0	0	0	0
Student_Elem	School	-0.22	-0.07	0	0	-0.9
Student_Elem	Other	-0.21	0.04	0	0	-0.75
Student_Elem	Stop	-1.5	-0.5	-0.03	0	-0.25

Person Type	Activity	Time	Dist	Dist^2	Dist^3	ln(Dist +1)
Student_High	School	-0.4	-0.15	0	0	0
Student_High	Other	-0.21	0.04	0	0	-0.75
Student_High	Stop	-1.5	-0.5	-0.03	0	-0.25
Student_Univ	School	-0.1	-0.05	0	0	-1.1
Student_Univ	Other	-0.21	0.04	0	0	-0.75
Student_Univ	Stop	-1.5	-0.5	-0.03	0	-0.25
NonWorker	Other	-0.21	0.04	0	0	-0.75
Senior	Other	-0.21	0.04	0	0	-0.75

Destination Choice Model Validation

The destination choice models were calibrated for the trip lengths observed in the available household travel survey. A summary of the trip length validation for the modeled primary and secondary trip purposes is given below.

Table 10: Average Trip Length Validation

	Trip Length (miles)	
Purpose	**HH Survey**	**Model**
Work	8.35	8.85
School (K8)	3.31	3.58
High School	4.26	4.47
Post-Secondary	8.61	8.93
Other/non-work	4.74	5.19
Stops on Work Tour	5.15	5.49
Stops on School Tour	4.17	4.47

Figure 11: Work/School Trip Length Validation

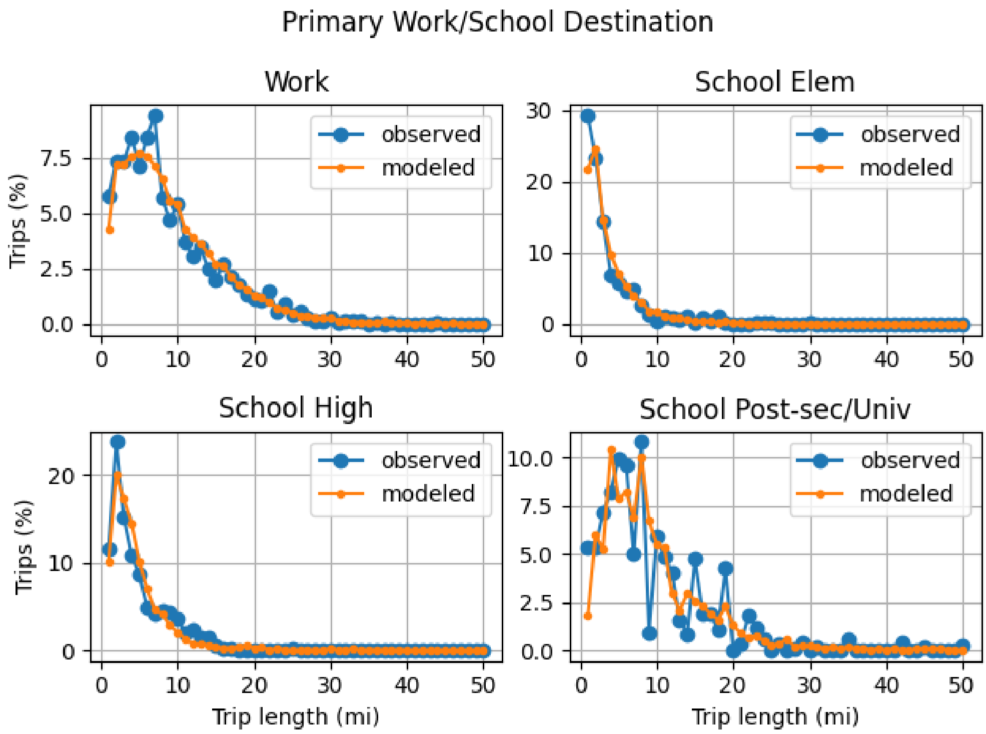
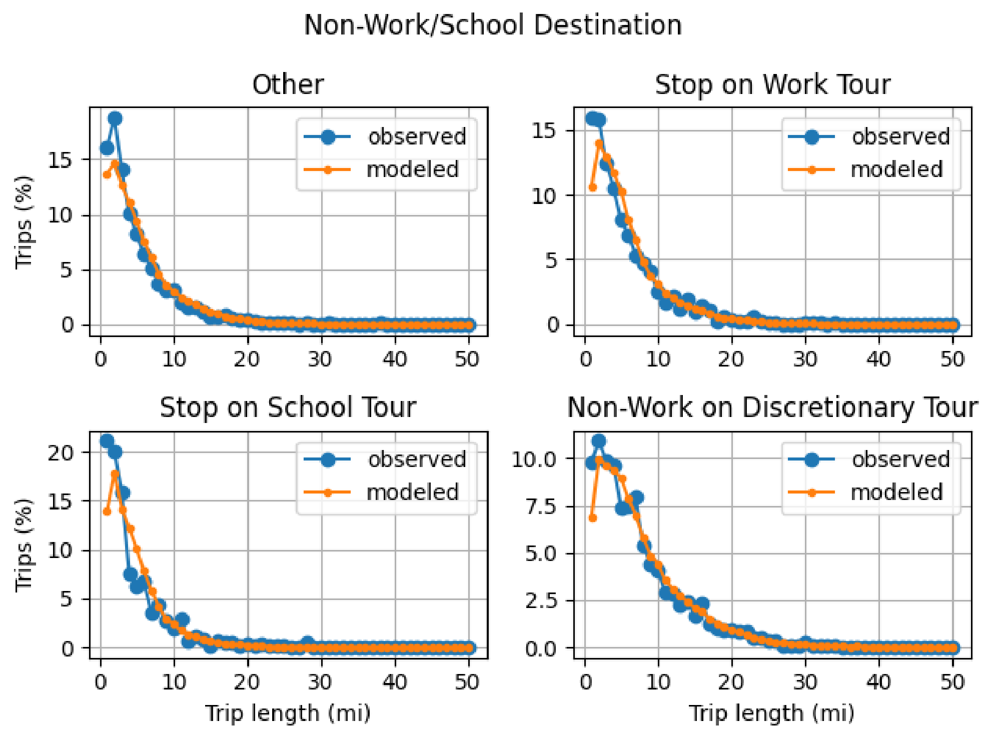


Figure 12: Discretionary and Other Trip Length Validation



Tour Based Mode Choice

Mode choice: The mode choice functional form is the commonly used logit model. Mode choice can be specified at the person type level as well as the destination activity level. In the PPACG model, it is specified at the person type and destination activity level. The freedom of choice restrictions within trip chains where a traveler may switch between travel modes from one leg of the tour to another is accounted for by defining modes as exchangeable or non-exchangeable. Thereafter, the tour-based model calculates a logit choice model. In the tour-based framework, mode choice is computed either based on primary activity when using rubber-banding or applied to each trip leg along the tour when rubber-banding is turned off. Trip chains or tours with work or school were calculated using rubber-banding and other trip chains were calculated using the sequential mode choice model. The coefficients for the mode choice model were adopted from the FHWA-TMIP[4] guidelines. The constants were then adjusted to align the mode choice results with the available travel survey data.

Six travel modes were considered in the PPACG model. The coefficients and calibrated constants for these are summarized in the tables below.

Table 11: Mode Choice Coefficients

Purpose	Time (Min)	Cost ($)
Work	-0.018	-0.184
Non-work	-0.024	-0.25

Table 12: Calibrated Alternative Specific Constants

Person Type	Purpose	Auto (sov)	Auto (hov)	Transit	Bike	Walk	SchBus
Worker_GCP	Work	0	-3.59	-4.03	-4.04	-3.03	N/A
	Other	0	-1.9	-2.93	-4.04	-2.58	N/A
Worker_MCT	Work	0	-3.59	-5.93	-4.04	-3.03	N/A
	Other	0	-1.9	-4.93	-4.04	-2.58	N/A
Worker_MIL	Work	0	-3.59	-5.93	-4.04	-3.03	N/A
	Other	0	-1.9	-4.93	-4.04	-2.58	N/A
Student_Elem	School	N/A	0	-999	-4.16	-1.76	-0.932
	Other	N/A	0	-999	-4.16	-1.76	N/A

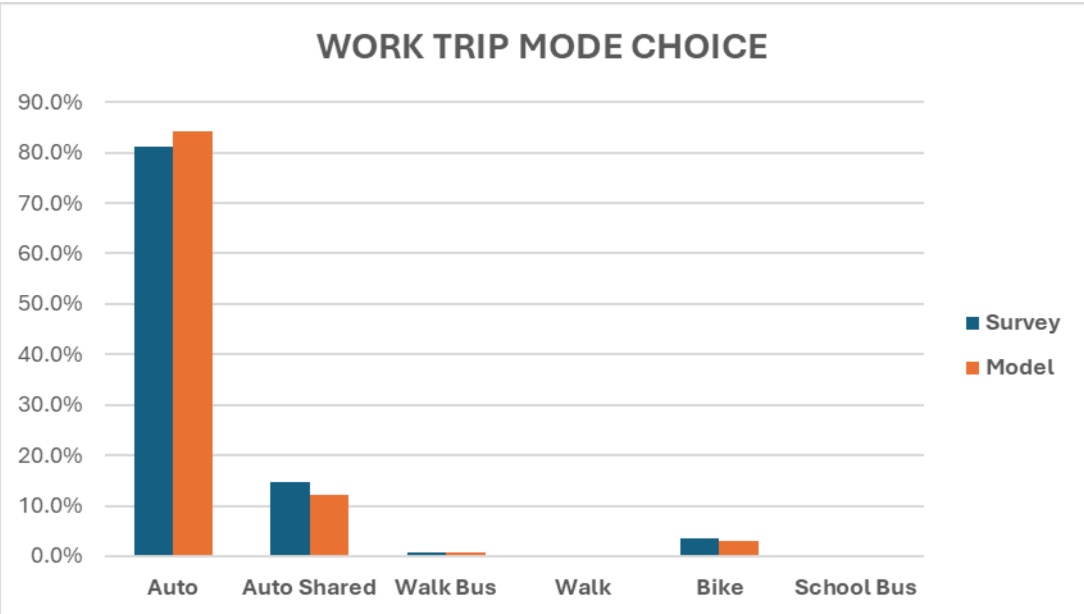
[4] https://www.fhwa.dot.gov/planning/tmip/publications/other_reports/validation_and_reasonableness_2010/fhwahep10042.pdf

Student_High	School	-0.402	0	-4.42	-3.09	-1.46	-0.622
	Other	-0.402	0	-4.42	-3.09	-1.46	-0.622
Student_Univ	School	1.67	0	-1.11	-1.72	-1.45	N/A
	Other	1.67	0	-1.11	-1.72	-1.45	N/A
Non_worker	Other	0	-1.9	-3.43	-999	-3.58	N/A
Senior	Other	0	-1.3	-3.91	-999	-2.73	N/A

Mode Choice Model Validation

The mode choice model was validated against the available expanded survey data. These summaries are presented below.

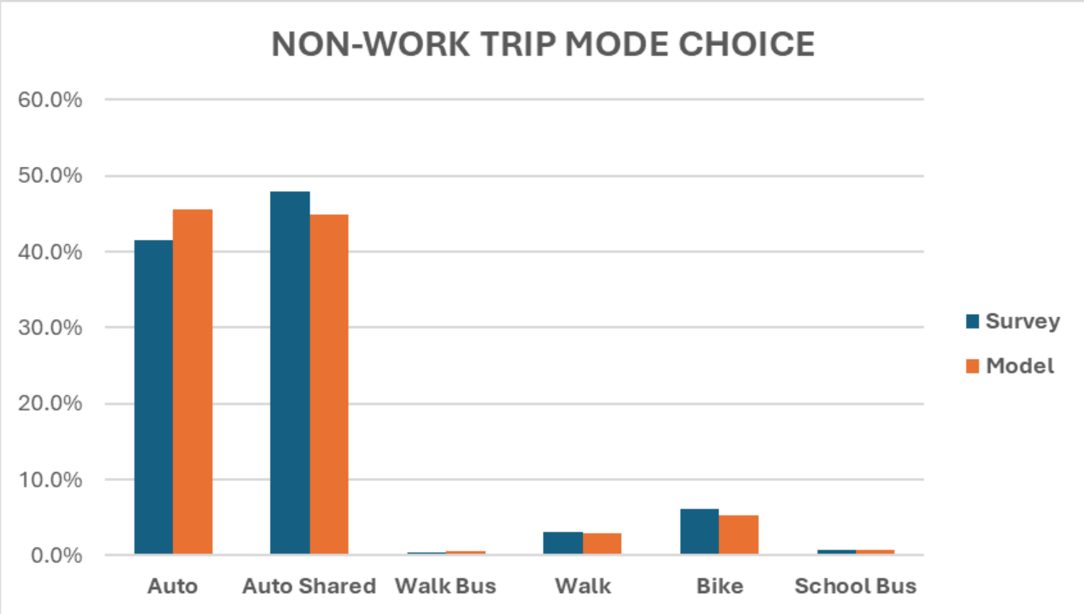
Figure 13: Work Mode Choice Validation



WORK

Observed		Estimated		Estimated Scaled		Observed %		Estimated %	
Mode	Trips	Mode	Trips	Mode	Trips	Mode	Percent	Mode	Percent
Auto	181,419	Auto	200,962	Auto	200,962	Auto	81.2%	Auto	84.2%
Auto Shared	32,606	Auto Shared	28,857	Auto Shared	28,857	Auto Shared	14.6%	Auto Shared	12.1%
Walk Bus	1,574	Walk Bus	1,499	Walk Bus	1,499	Walk Bus	0.7%	Walk Bus	0.6%
Walk	140	Walk	217	Walk	217	Walk	0.1%	Walk	0.1%
Bike	7,684	Bike	7,213	Bike	7,213	Bike	3.4%	Bike	3.0%
School Bus	-	School Bus	-	School Bus	-	School Bus	0.0%	School Bus	0.0%
Total	223,424	Total	238,748	Total	238,748	Total	100%	Total	100%

Figure 14: Non-work Mode Choice Validation



NON WORK

Observed		Estimated		Estimated Scaled		Observed %		Estimated %	
Mode	Trips	Mode	Trips	Mode	Trips	Mode	Percent	Mode	Percent
Auto	786,045	Auto	1,128,195	Auto	1,128,195	Auto	41.5%	Auto	45.6%
Auto Shared	908,111	Auto Shared	1,109,467	Auto Shared	1,109,467	Auto Shared	47.9%	Auto Shared	44.9%
Walk Bus	9,121	Walk Bus	12,699	Walk Bus	12,699	Walk Bus	0.5%	Walk Bus	0.5%
Walk	59,630	Walk	73,503	Walk	73,503	Walk	3.1%	Walk	3.0%
Bike	115,794	Bike	131,939	Bike	131,939	Bike	6.1%	Bike	5.3%
School Bus	15,377	School Bus	16,677	School Bus	16,677	School Bus	0.8%	School Bus	0.7%
Total	1,894,078	Total	2,472,480	Total	2,472,480	Total	100%	Total	100%

3.3 Time of Day Calculation

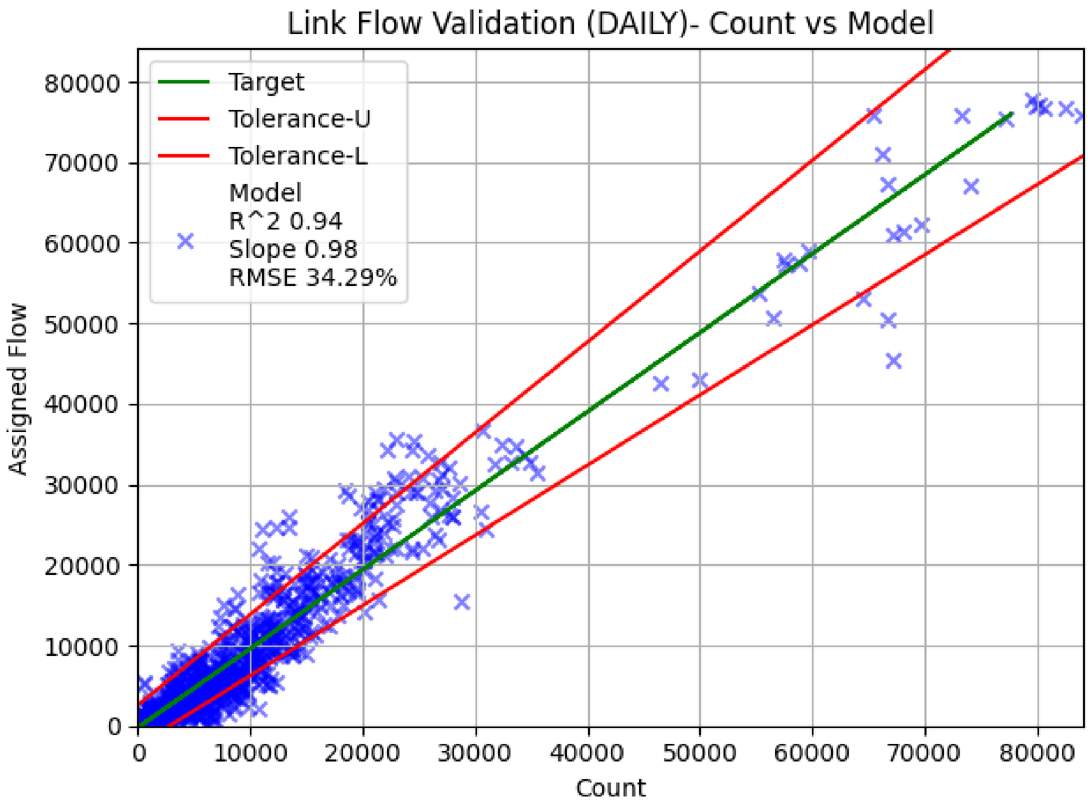
Time of day calculation: The time-of-day distribution of trips in the aggregate tour-based structure is based on direct application of empirical departure time profiles of each activity pair by person type. These departure time profiles were extracted from the existing travel survey. Since the travel survey was from 2010, it did not account for the post-covid changes seen in the time-of-day distribution of travel. An updated travel survey or other alternative information would allow a more accurate modeling of time-of-day travel patterns. A more detailed discussion around this issue presented in the later section on simulation-based dynamic assignment (SBA).

3.4 Network Assignment

Network assignment: Only motorized modes are assigned to obtained network flows in the PPACG model. Traffic assignment is performed for five macro time periods: Early, AM, MD, PM and Evening. Network flows from each of the time periods are aggregated into daily traffic flows. Headway based assignment is used for transit assignment. Demand is calculated at the same resolution as the traffic assignment and assigned at once with AM, PM periods using an average peak headway and the Early, MD and Evening periods using an average off-peak headway.

Traffic Assignment Validation

The traffic assignment was validated using the AADT model flows and average traffic counts available. An RMSE of 35%, R^2 of 0.94 and slope of 0.98 was achieved for the overall network. The statistics for each major link classification are presented in the table below.



FACTYPE	FACNAME	NUMOBS	SLOPE	%RMSE
1	Interstates	32	0.939	8.10%
2	Expressway	49	1.016	14.80%
3	Principal Arterials	375	1.24	23.80%
4	Minor Arterials	285	0.815	37.10%
5	Collector	312	0.772	59.90%
6	Residential	0	0	N/A
7	Ramp	93	1.007	28.30%

Transit Assignment Validation

The transit assignment was validated against overall line boardings. The mode choice coefficients were adjusted to produce overall line boardings that reflected the overall observed line boardings. The transit system has seen a steady decline in ridership from 2019 to 2021. As a result, an average of total line boardings over this period was used to validate the transit line boardings produced by the model. The transit route choice was not specifically calibrated due to the overall sparsity of ridership and relatively older travel survey. The boardings by route are summarized in the table below.

ROUTE_ID	ROUTE_CODE	ROUTE_NAME	MODEL_BOARDINGS	OBS_BOARDINGS
1	MMT_3416	Hillside - Hancock Plaza	555	564
10	MMT_3417	Hwy 115 - PPSC	218	425
11	MMT_3418	World Arena - PPSC	459	670
12	MMT_3419	Palmer Park Blvd	139	73
14	MMT_3420	Chestnut St - G.O.G. Rd	99	179
15	MMT_3421	FOUNTAIN BLVD -E CHEYENNE MTN BLVD	44	52
16	MMT_3422	Brookside - Uintah Gardens	112	85
17	MMT_3423	19TH STREET/FILLMORE	79	68
18	MMT_3424	Union Blvd	105	20
19	MMT_3425	WEBER - EAGLE ROCK	131	263
2	MMT_3426	CENTENNIAL BLVD - G.O.G. Rd	76	119
22	MMT_3427	SOUTHBOROUGH VIA MURRAY BLVD	322	218
23	MMT_3428	Barnes Rd. - Tutt Blvd	421	258
25	MMT_3430	N. ACADEMY BLVD - VOYAGER	1,556	802
27	MMT_3431	S. ACADEMY BLVD - PPSC	477	458
3	MMT_3432	COLORADO AVE - MANITOU	341	534
32	MMT_3433	SECURITY/WIDEFIELD	189	88
33	MMT_3434	INCLINE/COG SHUTTLE	32	400
34	MMT_3435	GOG/AUSTIN BLUFFS PKWY	158	123
35	MMT_3436	LAS VEGAS ST/ PPSC	28	47
38	MMT_3439	UNION/ CHILDRENS HOSPITAL	64	7
39	MMT_3440	CORPORATE DR - VOYAGER PKWY	123	54
4	MMT_3441	S. 8th STREET - BROADMOOR	155	202

ROUTE_ID	ROUTE_CODE	ROUTE_NAME	MODEL_BOARDINGS	OBS_BOARDINGS
40	MMT_3442	VOYAGER - RAMPART PPSC	51	32
5	MMT_3443	Boulder - Citadel	744	923
6	MMT_3444	FILLMORE - Citadel	137	131
7	MMT_3445	Pikes Peak Ave. - Citadel	235	355
8	MMT_3446	Cache La Poudre - Citadel	32	67
9	MMT_3447	NEVADA - UCCS	237	344
ZEB	MMT_3448	ZEB Downtown Shuttle	438	65
TOTAL			**7,757**	**7,626**

3.5 Simulation Based Dynamic Traffic Assignment (SBA)

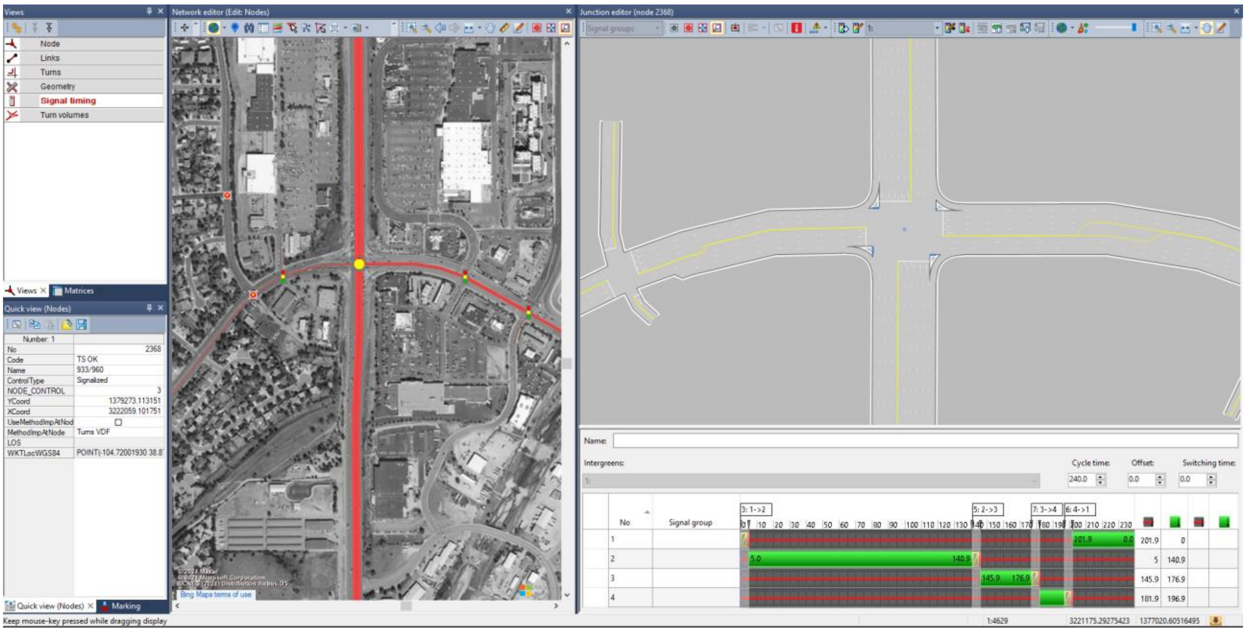
One of the key uses of the PPACG model is evaluation of air quality conformity and GHG analysis. While the actual GHG analysis is performed using US EPA's MOVES software, the link speed and volume inputs required in the analysis are generated using the PPACG model. The link speed and volume inputs are required at hourly intervals. As a result, simulation based dynamic traffic assignment (SBA) integrated into Visum was used as a post-process to obtain network link speeds at hourly intervals with relevant accounting of intersection level delays. SBA involves two components. Network preparation and hourly demand generation. These two items are discussed next.

Network Preparation for SBA

The Visum modeling platform used to implement the PPACG model natively stores multi-resolution network data. Here, the detailed lane geometry and intersection control (signal timings) can be specified in addition to the typical link-node data used in static traffic assignments. The appropriate level of network detail is used or ignored based on the type of traffic assignment selected by the user. The multi-resolution network storage concept is illustrated in the figure below.

The entire PPACG model network was carefully reviewed for the correct number of roadway lanes, posted speeds and intersection control type. Aerial imagery was used to code detailed intersection geometry with appropriate turn bays and lane grouping at all intersections in the model network. The network base year for the model is 2020. There are ~1500 controlled intersections in the model network. Out of these, ~700 intersections are signalized. Signal phasing plans for all these intersections were developed based on the lane grouping at approach legs. The green time and splits were calculated based on turn flows obtained from the static traffic assignment. Coding signal timings in this manner allows an overall consistent delay representation in the network. It also allows the methodology to be extended to all forecast networks.

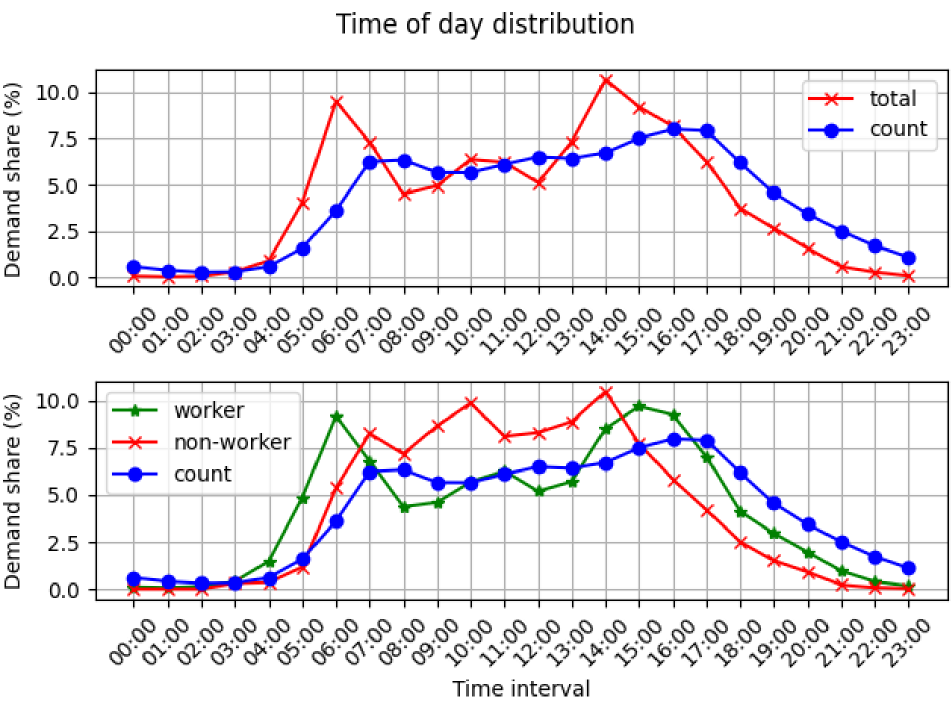
Figure 15: Integrated Multi-resolution Network Representation in Visum



Demand Preparation for SBA

The tour-based model allows flexibility in specifying outputs for any time of day. Ordinarily, the hourly demand for the SBA would be derived by specifying an hourly demand output setting in the tour-based model calculation setup.

Figure 16: Pre-COVID19 Demand Profile vs Post-COVID19 Count Profile



However, the changes in time use patterns seen after COVID19 and time of day factors derived from relatively older travel survey data (2010) made the direct use of time-of-day factors applied to activity pairs unviable. This was clearly seen by plotting the 24-hour demand profiles from the travel survey against the more updated 24-hour count data. The post-COVID19 time-of-day count profiles exhibit a much greater spreading of the traffic flows as opposed to the shaper AM and PM peak flows exhibited by the demand profiles extracted from the pre-COVID19 2010 travel survey. This change in travel pattern presented a major challenge in the development of 24-hour demand profiles and model calibration in general. Since count data was the most updated source of time-of-day distribution of traffic patterns, dynamic matrix estimation was used to re-profile the demand calculated for macro time periods (EA, AM, MD, EV) into hourly trip tables for use in SBA. The link flow validation for hourly flows is tabulated and plotted below. The early morning and late evening time periods have a greater %RMSE due to the overall lower volumes but are within the NCHRP allowable tolerance for hourly flows.

Table 13: SBA Hourly Link Flow Validation

Time Interval	R2	Slope	%RMSE
00:00	0.93	0.86	63.64%
01:00	0.89	0.85	75.01%
02:00	0.87	0.82	74.52%
03:00	0.8	0.82	81.80%
04:00	0.66	0.59	99.22%
05:00	0.76	0.78	72.51%
06:00	0.89	0.91	42.61%
07:00	0.93	0.98	32.52%
08:00	0.95	0.98	31.37%
09:00	0.96	0.98	30.18%
10:00	0.96	0.99	28.19%
11:00	0.96	1.01	28.21%
12:00	0.96	1.01	28.15%
13:00	0.96	1.01	27.65%
14:00	0.96	1.01	27.75%
15:00	0.95	1.02	29.80%
16:00	0.95	1.02	29.45%
17:00	0.95	1.01	29.61%
18:00	0.95	0.99	32.55%
19:00	0.94	0.98	42.88%
20:00	0.93	0.99	47.45%
21:00	0.94	0.96	47.56%
22:00	0.94	0.93	51.48%
23:00	0.93	0.90	58.48%
DAILY	**0.96**	**1.00**	**27.78%**

Figure 17: AM Period Hourly Link Flow Validation

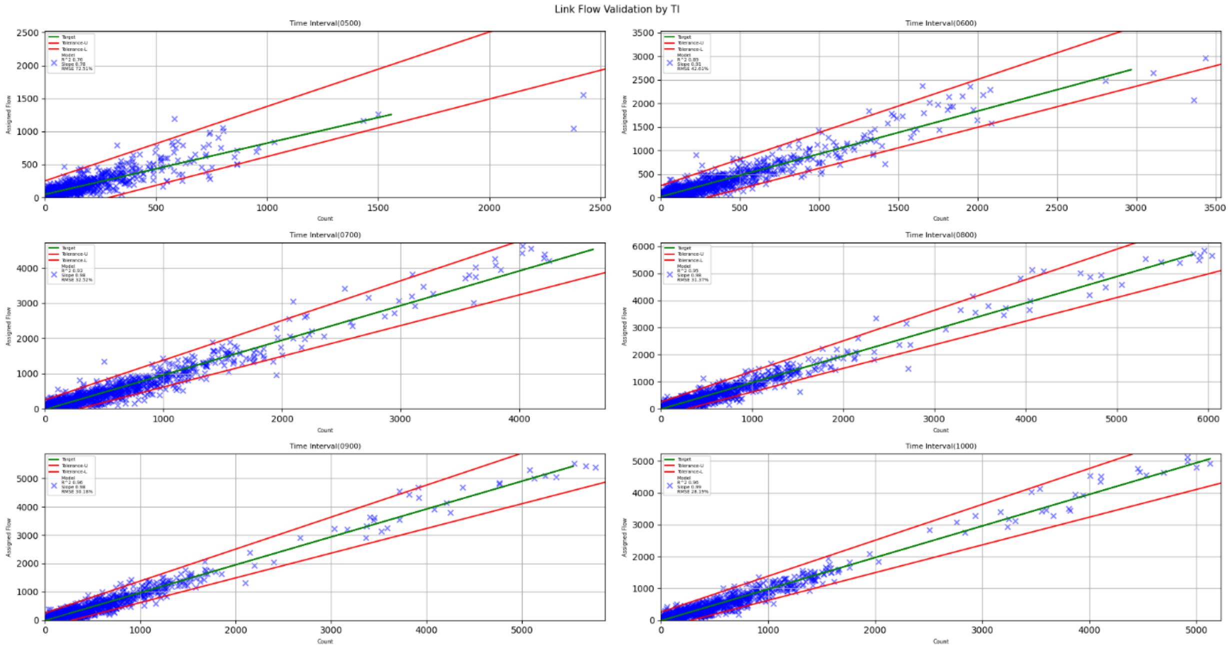


Figure 18: PM Period Link Flow Validation

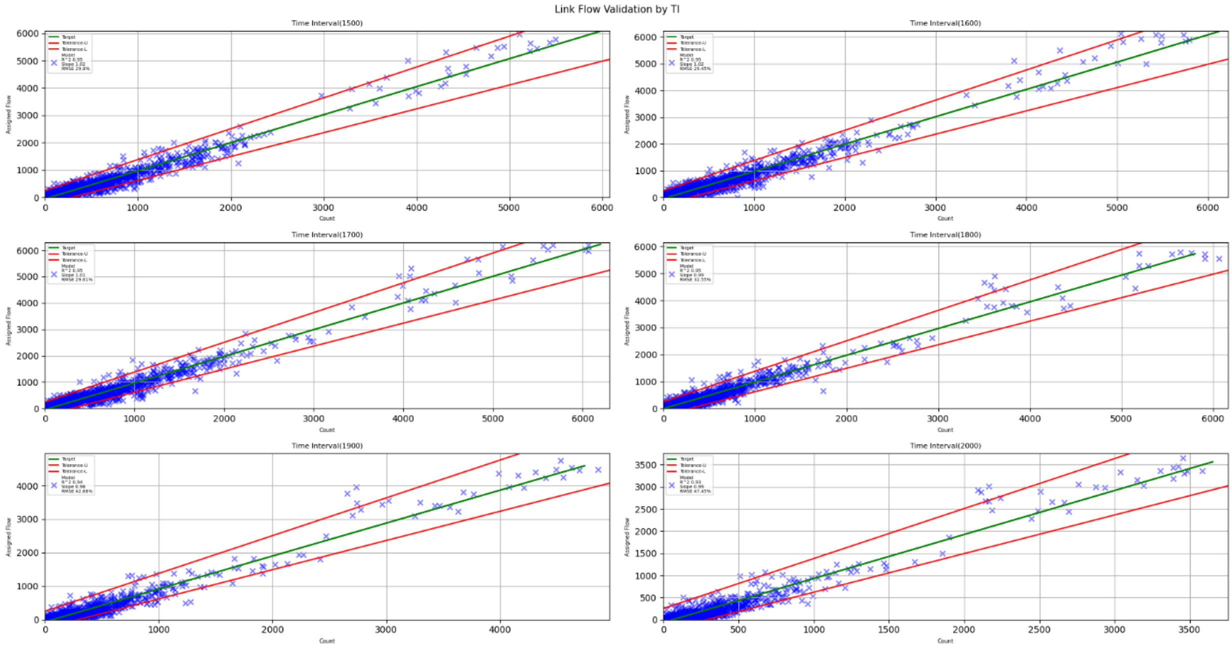
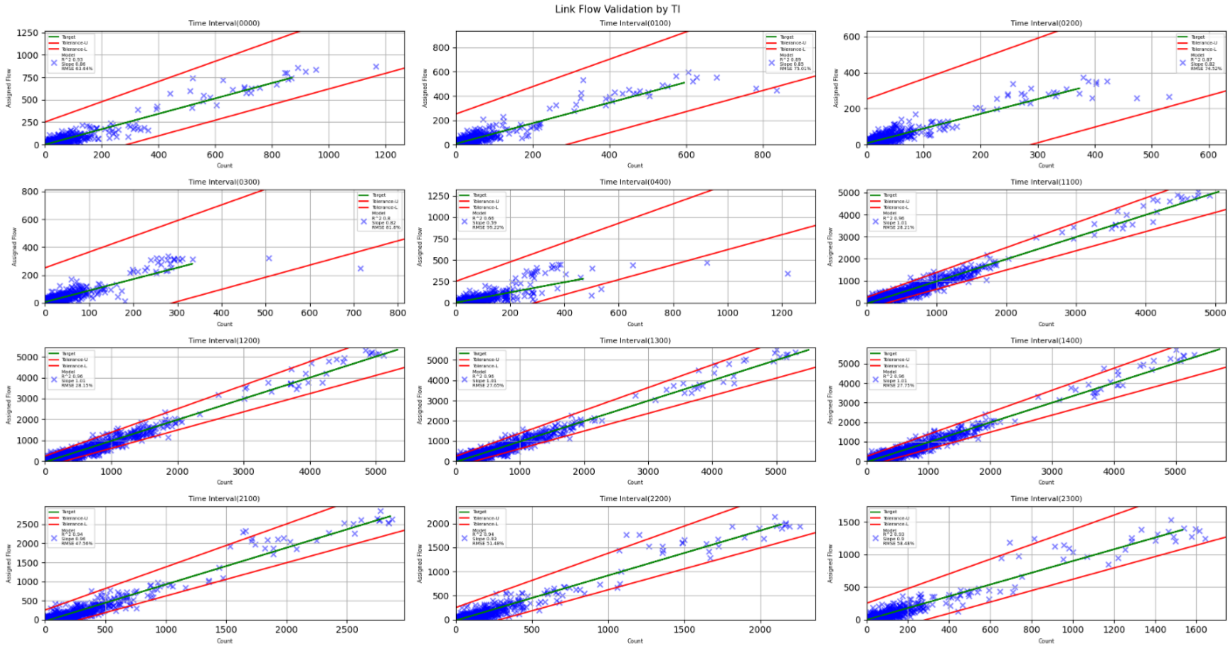


Figure 19: OP Link Flow Validation



The dynamic matrix estimation method implemented in Visum is based on a least squares minimization formulation. Here, the sum of squared error between network counts and network flows arising from traffic assignment is minimized using a gradient method.

Conceptually, the dynamic matrix estimation method is like the static variant but adds a time dimension to the problem formulation. In the dynamic variant, the rows of the flow matrix no longer correspond to the count locations, but to the cross product of count locations and analysis time intervals; the columns of the flow matrix no longer correspond to the quantity of the OD pairs, but to the entire demand time series. An entry in the flow matrix corresponds to the proportion of the demand of an OD pair during a demand time interval that passes a count location during an analysis time interval.

Since the original seed trip matrices and total number of trips are used in the overall solution formulation, the method also minimizes the distortion of the original matrix structure and preserves the number of trips in the seed matrices. This property also allows the use of adjusted base year hourly trip matrices to generate hourly link flows when assigned using SBA and as a reasonable basis for generating hourly trip matrices for the forecast years. As noted earlier, re-calibration of the tour-based model based on more steady traffic patterns and an updated travel survey would eliminate the necessity of using the dynamic matrix estimation post-process to obtain hourly trip matrices aligned with the observed time of day traffic patterns.

Figure 20: Steps to Obtain Hourly Link Flows - Base Condition

Calculate 24-hour SBA using macro time period demand (EA, AM, MD, PM, EV)

↓

Dynamic matrix correction using 24-hour link counts to macro period demand

↓

24 hourly trip matrices correct for time of day and traffic pattern

↓

SBA-Assignment of corrected time of day trip matrices to obtain hourly link and turn flows

The methodology used in developing hourly trip assignment matrices for the forecast conditions is illustrated in the flowchart below.

4. *Remarks*

One of the challenges in the model calibration process was that the available travel survey was from 2010, and the latest data used in the model validation was over multiple years starting 2019 and ending 2022 with the COVID19 pandemic and its effects occurring during this period. As a general strategy, the model was thus not overfit to observations. It would be of benefit to take up a more thorough calibration and validation exercise when new travel survey data with a more stable set of observations from new travel trends is available.

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MEMORANDUM

TO: Ms. Marissa Gaughan, CDOT Multimodal Planning Branch Manager

FROM: Dale Tischmak and Jake Fritz

DATE: January 21, 2022

SUBJECT: DRAFT MOVES3 Greenhouse Gas Modeling Methodology (117429-32)

Introduction

This document summarizes the methodology used to calculate greenhouse gas (GHG) emissions for the CDOT Statewide Travel Demand Model (TDM). Previous GHG modeling to support CDOT was conducted by APCD. This methodology replicates APCD's modeling process as best as possible.

For more information about GHG modeling using MOVES, see the *Using MOVES for Estimating State and Local Inventories of On-road Greenhouse Gas Emissions and Energy Consumption* guidance document linked to in the references (i.e., EPA 2016).

The process begins with generating emission rates using the EPA's Motor Vehicle Emission Simulator version 3.0.1 (MOVES3). The emission rates are multiplied by the vehicle miles traveled from the TDM. The result is an emissions inventory. A series of data engineering steps are required to prepare the rates and VMT into desirable and compatible formats.

MOVES3 Run Specifications

The run specification (RunSpec) parameters outlined below were used to calculate GHG emission rates with MOVES. They are consistent with APCD's process to calculate GHG emissions.

The four modeled years 2025, 2030, 2040, and 2050 used the same run specifications except for where specified (e.g., the year being modeled). Each of the four modeled years has six related run specifications to separate the emission rates by vehicle type, as described in the On-road Vehicles section.

Scale

The "Scale" parameters define the model type (on-road or non-road), domain/scale, and calculation type.

Model Type

On-road was the model type selected. This estimates emissions from motorcycles, cars, buses, and trucks that operate on roads.

Non-road/off-network emissions were not included. These emissions are from equipment used in applications such as recreation, construction, lawn and garden, agriculture, mining, etc. and are outside of the scope of this analysis.

Domain/Scale

MOVES allows users to analyze mobile emissions at various scales: National, County, and Project. While the County scale is necessary to meet statutory and regulatory requirements for SIPs and transportation conformity, either the County or National scale can be used for GHG inventories. EPA recommends using the

County scale for GHG analysis. The County scale allows the user to enter county-specific data through the County Data Manager. Providing local data significantly improves the precision of the modeling results (EPA 2016).

The County scale was used.

Calculation Type

MOVES has two calculation types - Inventory (total emissions in units of mass) or Emissions Rates (emissions per unit of distance for running emissions or per vehicle for starts and hotelling emissions) in a look-up table format must be post-processed to produce an inventory. Either may be used to develop emissions estimates for GHGs (EPA 2016).

The Emission Rates calculation type was used.

Time Span

The "Time Span" parameters define the years, months, days, and hours that emissions are calculated.

When Emission Rates is chosen, users may choose to approach the selection of options in the Time Spans Panel differently than when running MOVES in Inventory mode. For example, when modeling running emission rates, instead of entering a diurnal temperature profile for 24 hours, users can enter a range of 24 temperatures in increments that represent the temperatures over a period of time. By selecting more than one month and using a different set of incremental temperatures for each month, users could create a table of running emission rates by all the possible temperatures over an entire season or year (EPA 2016).

When using Emission Rates instead of Inventory, the time aggregation level is automatically set to Hour and no other selections are available. Pre-aggregating time does not make sense when using Emission Rates and would produce emission rates that are not meaningful (EPA 2016). However, the year, month, and day must still be specified and will affect the emission rates calculated.

The time span parameters specified below were also used because the TDM outputs represent an annual average weekday.

Years

The County scale in MOVES allows only a single calendar year in a RunSpec. Users who want to model multiple calendar years using the County scale will need to create multiple RunSpecs, with local data specific to each calendar year, and run MOVES multiple times (EPA 2016).

The years used were 2025, 2030, 2040, and 2050. Emission rates for each of these years were calculated separately. This accounts for information such as a changing age distribution of vehicles and their corresponding fuel efficiency.

Months

MOVES allows users to calculate emissions for any or all months of the year. If the user has selected the Emission Rates option, the Month can be used to input groups of temperatures as a shortcut for generating rate tables for use in creating inventories for large geographic areas (EPA 2016).

The months used were January and July to match the process described by APCD. These represent winter and summer months and generally the extremes in annual weather conditions. This accounts for changes in fuel efficiency between warm and cold temperatures throughout the year. The arithmetic averages of emission rates from January and July were used for the final emissions inventory.

Days

Weekdays and weekend days can be modeled separately in MOVES. MOVES provides the option of supplying different speed and VMT information for weekdays and weekend days to allow the calculation of separate emissions estimates by type of day (EPA 2016).

The days used were weekdays to match the TDM output data. These represented the emission rates for an average weekday. The results were escalated later to approximate a full year.

Hours

The hours used were all 24 hours of the day (i.e., clock hours of 1 AM, 2 AM, 3 AM, etc.). These represent the emission rates for individual hours of a day. This accounts for changes in fuel efficiency between warm and cold temperatures throughout the day.

Geographic Bounds

The "Geographic Bounds" parameter defines the county(s) used. For a county-scale run, only one county can be selected per RunSpec. The county used was Adams County, Colorado. The county defines input parameters such as the meteorology data used to estimate emission rates.

On-road Vehicles

MOVES describes vehicles by a combination of vehicle characteristics (e.g., passenger car, passenger truck, light commercial truck, etc.) and the fuel that the vehicle is capable of using (gasoline, diesel, etc.). The [Panel] is used to specify the vehicle types included in the MOVES run (EPA 2016).

The "On-road Vehicles" parameter defines the source types (i.e., vehicle types) and their fuels (gasoline, diesel, electricity, etc.). All combinations of vehicle types and fuels available in MOVES3 were used to calculate the emission rates. APCD's process, which was being followed, assigns TDM mileage based on a modified HPMS category. To calculate aggregate emission rates for each HPMS category (i.e., merging all of the relevant source types and fuel types), each of the six HPMS categories used a separate RunSpec. It is important to note that APCD's modified HPMS category does not match the MOVES HPMS types for source types 21, 31, and 32. When this methodology document refers to HPMS categories, it is generally referring to APCD's HPMS categories. The figure below illustrates the HPMS categories.

	A	B	C	D	E
1	sourceTyp	sourceTypeName	HPMSVtypeID	HPMSVtypeName	**HPMS from APCD**
2	11	Motorcycle	10	Motorcycles	**10**
3	21	Passenger Car	25	Light Duty Vehicles	**20**
4	31	Passenger Truck	25	Light Duty Vehicles	**30**
5	32	Light Commercial Truck	25	Light Duty Vehicles	**30**
6	41	Other Buses	40	Buses	**40**
7	42	Transit Bus	40	Buses	**40**
8	43	School Bus	40	Buses	**40**
9	51	Refuse Truck	50	Single Unit Trucks	**50**
10	52	Single Unit Short-haul Truck	50	Single Unit Trucks	**50**
11	53	Single Unit Long-haul Truck	50	Single Unit Trucks	**50**
12	54	Motor Home	50	Single Unit Trucks	**50**
13	61	Combination Short-haul Truck	60	Combination Trucks	**60**
14	62	Combination Long-haul Truck	60	Combination Trucks	**60**

Road Type

The Road Type Panel is used to define the types of roads that are included in the run. MOVES defines five different road types as shown in Table 3-1. Generally, all road types should be selected including Off-Network. Selection of road types in the Road Type Panel determines the road types that will be included in the MOVES run results (EPA 2016).

Table 3-1: MOVES Road Types

Roadtypeid	Road type	Description
1	Off-Network	Locations where the predominant activity is vehicle starts, parking and idling (parking lots, truck stops, rest areas, freight or bus terminals)
2	Rural Restricted Access	Rural highways that can be accessed only by an on-ramp
3	Rural Unrestricted Access	All other rural roads (arterials, connectors, and local streets)
4	Urban Restricted Access	Urban highways that can be accessed only by an on-ramp
5	Urban Unrestricted Access	All other urban roads (arterials, connectors, and local streets)

All road types available in MOVES3 were used.

Pollutants and Processes

The Pollutants and Processes Panel allows users to select from various pollutants, types of energy consumption, and associated processes of interest. In MOVES, a pollutant refers to particular types of pollutants or precursors of a pollutant but also includes energy consumption choices. Processes refer to the mechanism by which emissions are released, such as running exhaust or start exhaust. Users should select all relevant processes associated with a particular pollutant to account for all emissions of that pollutant. Generally, for this project, that includes running emissions.

The CO2 Equivalent pollutant is the sum of the global warming potential of other greenhouse gases expressed as a unit of CO2 (EPA 2016) and CO2 Equivalents (CO2e) is the pollutant of interest for these GHG calculations. MOVES requires several other prerequisite pollutants for CO2e; however, only the emission rates for CO2e were needed for this project.

General Output

The "General Output" parameters define the output database, units, and activity.

Output Database

Results from the six related HPMS RunSpecs for a single emissions year can be stored in a single output database for convenience. The RunSpecs must have the same units and aggregation (EPA 2016). A different output database is needed for each year of emission rate calculations. A consistent and informative naming convention for all output databases is very valuable.

One output database was used for each year modeled (i.e., 2025, 2030, 2040, and 2050). Each output database contained results for six RunSpecs, where each RunSpec represented a different APCD HPMS type. The naming convention FHU used was as follows:

[firm]_[pollutant]_[year][region]_[description]_[database type]

[firm] = The company or agency performing the analysis.

[pollutant] = The pollutant(s) of interest.

[year] = The year that emission rates were generated for.

[region] = The geographic area that emission rates were generated for.

[description] = An abbreviated description of relevant notes for the RunSpec.

[database type] = Whether the database was an input or output database.

For example, the database "fhu_ghg_2025sw_wev_in" represented an input database for greenhouse gases, the year 2025, the Statewide Transportation Plan, with electric vehicles, and was performed by FHU.

Units

Users are free to choose any of the mass unit selection options but should generally choose a unit whose magnitude is appropriate for the parameters of the RunSpec (EPA 2016).

The units used for models were grams for mass, joules for energy, and miles for distance.

Activity

MOVES allows the user to select multiple activity output options (e.g., distance traveled, population, etc.). For Emission Rate calculations, distance and population are reported automatically, but the values in the output are intermediate steps in the rate calculation and do not represent the true activity (EPA 2016).

When calculating emission rates (as opposed to emission inventories), MOVES selects the activities hoteling hours, population, and starts without the option of changing them.

Output Emissions Detail

This panel allows the user to select the amount of detail provided in the output database. Certain selections on this panel are made by the MOVES software and cannot be changed, based on selections made on earlier panels. The more boxes checked on this panel, the more detail and segregation provided in the MOVES output database. More detail generally is not helpful for this process so no optional selections should be checked on this panel. For example, if Source Use Type were selected on this panel, emission rates for each of the MOVES vehicle Source Use Type categories would be reported in the output database, which would defeat the purpose of performing MOVES calculations based on consolidated HPMS category.

No optional aggregation selections were made on this panel. Source type detail was captured via the six HPMS RunSpecs for each year modeled, as described in the On-road Vehicles section. Since multiple source types were used for HPMS 30, 40, 50, and 60, emission rates were aggregated for into HPMS categories. That is, emission rates for MOVES source types 31 and 32 were aggregated into the HPMS 30 RunSpec, etc.

Input Database/County Data Manager

After completing the RunSpec, the next step is to supply MOVES with data to create an input database that is the basis for the emission rate calculations. When using the County scale, the County Data Manager (CDM) is used to create an input database and populate it with local data. Modelers can either rely on MOVES default information or local data that the user inputs, as is appropriate for the goals of the MOVES modeling. The data contained in the MOVES default database are typically not the most current or best available for any specific county. Therefore, with the exception of fuels, EPA recommends using local data for MOVES for GHG analyses when available to improve the accuracy of GHG emissions estimates. However, the MOVES default data (county level) may be the only or best source of that data readily available. Also consider that data consistency may be more important than data perfection for some GHG analyses. At a minimum, EPA strongly encourages the use of local VMT and vehicle population data. EPA believes these inputs have the greatest impact on the quality of results. However, if local data are not available, MOVES default data may be useful for some inputs without affecting the quality of the results (EPA 2016).

In Emissions Rates mode, a full gamut of input data must be provided, described below, for MOVES to run. Some of these inputs actually do not affect the ultimate emission rates (they would affect inventory mode output) but reasonable inputs in the CDM should be used for general data integrity. As a general rule, users should input accurate activity for the scenario being modeled regardless of whether MOVES is being used in Inventory or Emissions Rates mode (EPA 2016).

The "Create Input Database" parameters define the region-specific inputs such as distributions of road types, vehicle age distributions, and meteorology data. The parameters specified in RunSpecs pre-populate the input database with default data for some of the parameters. However, region-specific data should be used when available and not all parameters have default data.

One comprehensive input database was created for each year modeled. Each of the six HPMS RunSpecs for that year used that single input database and were saved to a single output database. The input data were entered with the MOVES County Data Manager window, as specified below.

Age Distribution

A typical vehicle fleet includes a mix of vehicles of different ages, referred to as Age Distribution in MOVES. MOVES covers a 31 year range of vehicle ages, with vehicles 30 years and older grouped together. MOVES allows the user to specify the fraction of vehicles in each of 30 vehicle ages for each of the 13 source types in the model. For estimating on-road GHG emissions, EPA recommends and encourages states to develop age distributions that are applicable to the area being analyzed (EPA 2016).

APCD has developed a vehicle age distribution, and it was used for each year modeled.

Average Speed Distribution

This input is more important for Inventory than Emission Rates. Vehicle power, speed, and acceleration have a significant effect on vehicle emissions, including GHG emissions. MOVES models those emission effects by assigning activity to specific drive cycles. The Average Speed Distribution Importer in MOVES calls for a speed distribution in VHT in 16 speed bins, by each road type, source type, and hour of the day included in the analysis. EPA urges users to develop the most detailed local speed information that is reasonable to obtain. However, EPA acknowledges that average speed distribution information may not be available at the level of detail that MOVES needs (EPA 2016).

The Emission Rates option in MOVES will produce a table of emission rates by road type for each speed bin. Total running emissions are then quantified outside of MOVES by multiplying the emission rates by the VMT for each source type in each vehicle speed category. Users should supply an appropriate speed distribution to produce the necessary emission rates (EPA 2016).

APCD uses MOVES default data for all years in emission rate mode for their GHG models. This was used for each year modeled. Since emission rates were calculated (as opposed to emission inventories), the average speed distribution used in MOVES will not change the emission rates calculated. The speeds are accounted for in the TDM data.

Fuel

Entering this input data into MOVES involves four tables – called FuelFormulation, FuelSupply, FuelUsageFraction, and AVFT (alternative vehicle fuels and technology) – that interact to define the fuels used in the area being modeled.

- The FuelSupply Table identifies the fuel formulations used in a region (the regionCounty Table defines which specific counties are included in these regions) and each formulation's respective market share;
- The FuelFormulation Table defines the properties (such as RVP, sulfur level, ethanol volume, etc.) of each fuel;
- The FuelUsageFraction Table defines the frequency at which E-85 capable (flex fuel) vehicles use E-85 vs. conventional gasoline; and
- The AVFT Table is used to specify the fraction (other than the default included in the sampleVehiclePopulation Table) of fuel types capable of being used (such as flex fuel vehicles) by model year and source type.

In general, users should review/use the default fuel formulation and fuel supply data provided in MOVES, with important exceptions noted below. EPA strongly recommends using the default fuel properties for a region unless a full local fuel property study exists.

The GHG effects of changes in the fuel mix used by vehicles can be modeled in MOVES. AVFT can be used to change the fraction of future vehicles using gasoline, diesel, CNG and electricity. These changes will be reflected in MOVES GHG emission rates.

The FuelUsageFraction Table allows the user to change the frequency at which E-85 capable vehicles use E-85 fuel vs. conventional fuel, when appropriate. MOVES contains default estimates of E-85 fuel usage for each county in the U.S. In most cases, users should rely on the default information.

The AVFT Table allows users to modify the fraction of vehicles using different fuels and technologies in each model year. In other words, the Fuel Tab allows users to define the split between diesel, gasoline, ethanol, CNG, and electricity, for each vehicle type and model year. For transit buses, the default table assumes that gasoline, diesel, and CNG buses are present in the fleet for most model years. If the user has information about the fuel used by the transit bus fleet in the county modeled, the user should be sure it is reflected in the AVFT Table (EPA 2016). ***NOTE: This tab can be critically important in CDOT's GHG calculations. This is where electric vehicle percentages, etc. are defined. This tab may vary among CDOT's scenarios and should not be overlooked.***

APCD uses MOVES default data for fuel supply, fuel formulation, and fuel usage fraction for all years in their GHG models. For AVFT, APCD uses custom inputs that includes electric vehicles for all years. These were used for each year modeled.

Meteorology

Ambient temperature and relative humidity data are important inputs for estimating on-road GHG emissions with MOVES. Ambient temperature and relative humidity are important for estimating GHG emissions from motor vehicles as these affect air conditioner use. MOVES requires a temperature (in degrees Fahrenheit) and relative humidity (in terms of a percentage, on a scale from 0 to 100) for each hour selected in the RunSpec. EPA recommends that users input the average daily temperature profile for each month if they are modeling all 12 months. Temperature assumptions used for estimating on-road GHG emissions should be based on the latest available information. The MOVES database includes default monthly temperature and humidity data for every county in the country. These default data are based on average monthly temperatures for each county from the National Climatic Data Center for the period from 2001 to 2011. These national defaults can be used for a GHG inventory, or more recent data can be used (EPA 2016).

If the Emission Rate calculation type is chosen in the RunSpec, users can enter a different temperature and humidity for each hour of the day to create an emission rate table that varies by temperature for running emissions processes. Emission rates for all running processes that vary by temperature can be post-processed outside of MOVES to calculate emissions for any mix of temperatures that can occur during a day. This creates the potential to create a lookup table of emission rates by temperature for the range of temperatures that can occur over a longer period of time such as a month or year from a single MOVES run (EPA 2016).

MOVES default meteorology data was used for all years. The county used was Adams County, Colorado for the months of January and July. Emission rates were post-processed to average winter and summer emission rates.

Road Type Distribution

MOVES does not have default data for this input, so it must be developed. The fraction of VMT by road type varies from area to area and can have a significant effect on GHG emissions from on-road mobile sources. EPA expects states to develop and use their own specific estimates of VMT by road type (EPA 2016).

If the Emission Rates option is used, MOVES will automatically produce a table of running emission rates by road type. Running emissions would then be quantified outside of MOVES by multiplying the emission rates by the VMT on each road type for each source type in each speed bin. In that case, data entered using the Road Type Distribution Importer is still required, but is not used by MOVES to calculate the rate. However, road type distribution inputs are important for Emission Rates runs involving non-running processes, because they are used by MOVES to calculate the relative amounts of running and non-running activity, which in turn affects the rates for the non-running processes (EPA 2016).

APCD uses a custom road type distribution for all years in their GHG models. This was used for each year modeled. Since emission rates were calculated (as opposed to emission inventories), the road type distribution used in MOVES will not change the emission rates calculated. The road types are accounted for in the TDM.

Source Type Population

MOVES does not have default data for this input, so it must be developed. APCD uses a custom source type distribution for all years in their GHG models. These data were used for each year modeled. The source type populations used in MOVES will not change the emission rates calculated. However, source population data are still needed as inputs for an emission rates MOVES run.

Vehicle Type VMT

MOVES does not have default data for this input, so it must be developed. EPA believes VMT inputs have the greatest impact on the results of a state or local GHG or energy consumption analysis. Regardless of calculation type, MOVES requires VMT as an input. MOVES can accommodate whatever VMT data is available: annual or average daily VMT, by HPMS class or MOVES source type. Therefore, there are four possible ways to enter VMT, allowing users the flexibility to enter VMT data in whatever form they have. EPA recommends that the same approach be used in any analysis that compares two or more cases (e.g., the base year and a future year) in a GHG analysis (EPA 2016).

The Output Emission Detail panel determines the detail with which MOVES will produce emission rates for running emissions, such as by source type and/or road type in terms of grams per mile. Total emissions are quantified outside of MOVES by multiplying the emission rates by the VMT for each source type and road type. However, users will still need to enter data using the Vehicle Type VMT Importer that reflects the VMT in the total area where the lookup table results will be applied. This is necessary because MOVES uses the relationship between source type population and VMT to determine the relative amount of time vehicles spend parked vs. running (EPA 2016).

APCD uses HPMS as the source type and annual as the time span for their GHG models. This was used for each year modeled. Since emission rates were calculated (as opposed to emission inventories), the VMT used in MOVES will not change the emission rates calculated. The VMT values are in the TDM data. However, VMT data are still needed as inputs for an emissions rate MOVES run.

Inspection/Maintenance Program

If a model is examining any nonattainment/maintenance areas, an inspection and maintenance (I/M) program may apply. I/M program inputs should be those used for SIP and conformity analyses and are generally available as defaults within MOVES. However, if a user is modeling CO2, N2O, and/or elemental carbon emissions only, or modeling area where no I/M program applies, the user should check the box on this tab (EPA 2016).

APCD uses the check box for “No I/M Program” for the Statewide Transportation Plan, since there is not a statewide emissions program that applies in these areas. This was used for each year modeled.

Others

APCD assumes MOVES default values for the starts, hoteling, idle, retrofit data, and generic tabs. This was left as is for each modeled year.

Output Database

When a RunSpec is executed in MOVES, the results are stored in the output database specified in the “General Output” parameters. HeidiSQL (or equivalent software) can be used to view and export the calculated emission rates.

MOVES Rate per Distance Table

The critical table in the output database with the calculated emission rates was the “rateperdistance” table. It contained emission rates for each combination of month, hour, pollutant, road type, speed bin, and vehicle type as specified in the RunSpec. The MOVESScenarioID field was the mechanism used by FHU to identify the HPMS source type.

The table was filtered to include only CO2e (i.e., pollutant ID 98) emission rates and exported to a comma-separated value (CSV) file. Because the table included emission rates for both January and July, and MOVES speed bins are not discrete speeds in miles per hour, post-processing of the emission rates was required to calculate emission inventories.

Processed Emission Rates

APCD provided several Access databases with calculation tools for processing the MOVES and TDM data. These Access databases are the basis for the post-MOVES data processing. The instructions contained below provide a narrative of what occurs, but these actions are already built into the Access databases.

The MOVES rate per distance output table needed to be manipulated to produce emission rates that could be related to the calculated vehicle speeds for road links in the TDM data. The emission rates for January and July needed to be averaged to create composite emission rates. The emission rates for the 16 speed bins (which cover 5 MPH ranges) in MOVES were linearly interpolated to provide emission rates for every mile per hour speed from 1 to 75, which is how speed data are presented in the TDM data.

The resulting table includes a total of 43,776 unique emission rates. That is, an emission rate for each combination of:

- MOVES Road Types 2-5
- HPMS Types 10/20/30/40/50/60
- Hours 1-24
- Speeds 1-75

Processing Annual Average Emission Rates

For each year/rate per distance table (i.e., this process must be repeated for 2025, 2030, 2040, and 2050):

- Filter to include only CO2e (pollutant ID 98) emission rates
- There were unique emission rates for each combination of:
    - Road type
    - HPMS type
    - Speed Bin
    - Hour
    - Month
- To get the average emission rates per year, each combination of road type, HPMS type, average speed bin, and hour were summed and divided by two (to average the corresponding emission rates for January and July)
- Seasonally averaged emission rate = (Winter Rate + Summer Rate)/2

Interpolating Emission Rates from Speed Bin to Integer Speeds

After seasonally averaging the emission rates, these rates were used to interpolate (linearly) between speed bins to get an emission of rate for every mile per hour for the speeds of 1 to 75 miles per hour. In general, the process used was:

- For adjacent speed bins, subtract the lower bin number emission rate from the higher bin number emission rate and divide by five to calculate a per mile per hour change in the emission rate (NOTE: emission rates generally decrease with increased speed)
- Add the appropriate emission rate change to the lower bin avgBinSpeed value to interpolate each mile per hour emission rate between the avgBinSpeed values
- For reference, the table below illustrates the MOVES speed bins
- Example for interpolating emission rate of 11 mph:
    - Speed per mph = 11 mph
    - Speed of Lower Speed Bin = 10 mph
    - Number of Speeds per Speed Bin = 5 (= 2.5 for speed bin 1; = 5 for all other speed bins)
    - ER of Lower Speed Bin = 4055 g/m (dummy data)
    - ER of Upper Speed Bin = 3421 g/m (dummy data)
    - 4055 + (3421 – 4055) * (11 – 10)/5 = 3928

avgSpeedBinID	avgBinSpeed	avgSpeedBinDesc
1	2.5	speed < 2.5mph
2	5	2.5mph <= speed < 7.5mph
3	10	7.5mph <= speed < 12.5mph
4	15	12.5mph <= speed < 17.5mph
5	20	17.5mph <= speed <22.5mph
6	25	22.5mph <= speed < 27.5mph
7	30	27.5mph <= speed < 32.5mph
8	35	32.5mph <= speed < 37.5mph
9	40	37.5mph <= speed < 42.5mph
10	45	42.5mph <= speed < 47.5mph
11	50	47.5mph <= speed < 52.5mph
12	55	52.5mph <= speed < 57.5mph
13	60	57.5mph <= speed < 62.5mph
14	65	62.5mph <= speed < 67.5mph
15	70	67.5mph <= speed < 72.5mph
16	75	72.5mph <= speed

Processed TDM

The TDM data are usually presented as an ESRI polyline shapefile format with each traffic link represented as one record (feature) and attributed with distances, total volumes, volumes per time period, and speeds per time period. A series of post-processing steps were performed to relate the relevant TDM data with the appropriate MOVES emission rates, as described below. The first step described below was done using ArcGIS. The other steps were done using the tools in the Access databases.

The resulting table includes aggregated VMT for each combination of:

- MOVES Road Types 2-5
- HPMS Types 10/20/30/40/50/60
- Hours 1-24
- Speeds 2.5-75

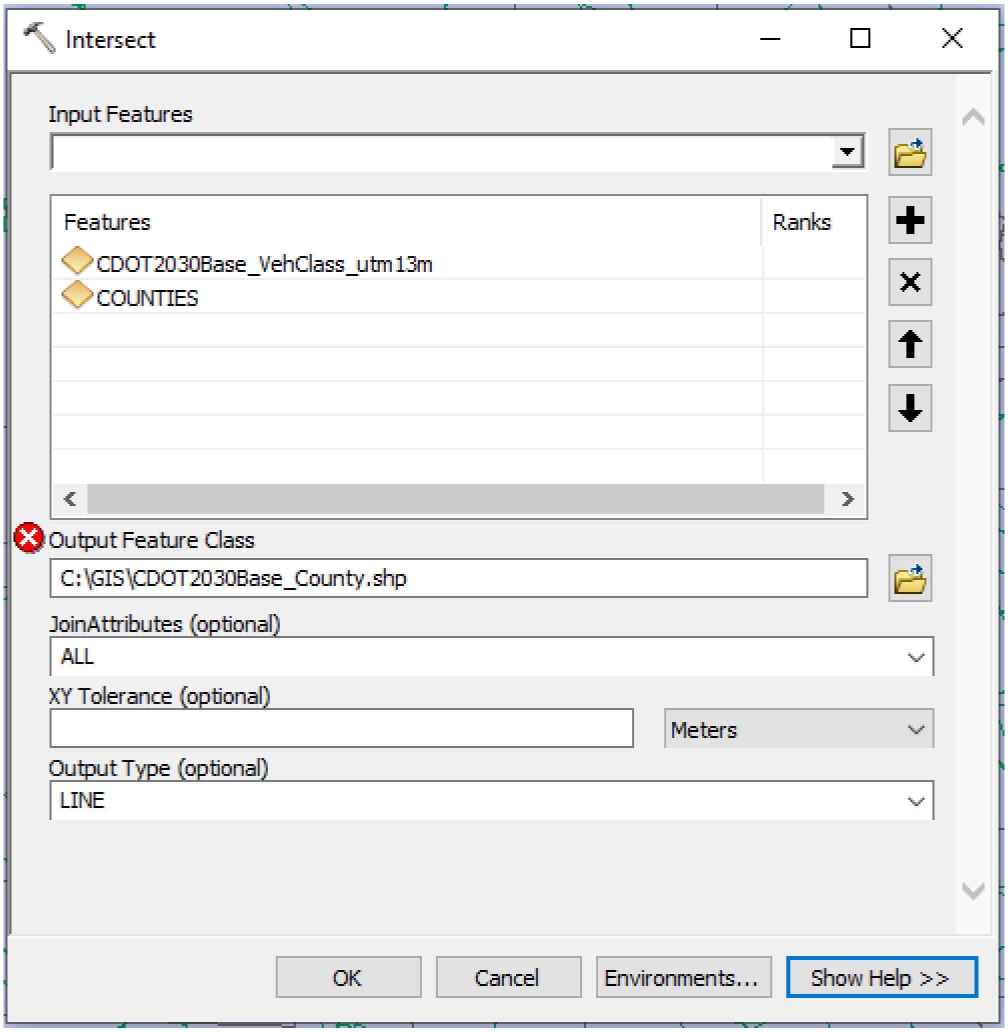
This process provides respective county names for each link to aggregate VMT by geography/region.

Attribute TDM with County Name

The first step was to attribute each link with the county name. The county information was necessary because it was used later in the process to filter VMT (and thus, on-road emissions inventory) by geography/region (e.g., MPO or non-MPO traffic). Performing this step later in the process would require significant modifications to the process.

The ArcGIS geoprocessing tool "Intersect" was used to attribute the TDM shapefile with county names for each roadway link (feature). The Input Features were the TDM shapefile and CDOT's "COUNTIES" shapefile that can be downloaded from OTIS. Unnecessary fields in the counties shapefile were deleted, so that the fields remaining were FID, Shape*, COUNTY, and CO_FIPS. The Output Feature Class name and file path could change, depending on the user's preference. The Join Attributes parameter was set to "ALL" which kept attributes from both input features. The Output Type parameter was set to "LINE" which set the output feature class to be the geometry of the TDM shapefile. The Environment was defaults except for the Output

Coordinate System. That was set to the projected coordinate system, "GRS_1980_UTM_Zone_13N" which matched the TDM shapefile's coordinate system.



The resulting output feature class had the same geometry and attributes as the TDM shapefile except for the following changes:

- Each link was attributed with the county name and FIPS number.
- Links within multiple counties were split (divided) into separate features at the county line(s). In these cases:
  - Both features still had the same attributes except for the county name and FIPS.
  - The distance attribute in the "DIST" field was now invalid since the feature was split.

To account for changes in distances for links that were in multiple counties, a new field "cntyMiles" was added to the output feature class. The geoprocessing tool "Calculate Geometry" was used on the "cntyMiles" field to calculate the distance of each link in miles. The "cntyMiles" field, rather than the "DIST" field, was used later in Access to calculate VMT.

The resulting attribute table was saved as a CSV file and used in the following steps.

Access Database

The TDM CSV file from the step above was imported into an Access database. The remaining post-processing steps were performed in this Access database, as described below.

Speeds

The TDM speeds were in floating decimal format and rounded to the nearest integer. Speeds less than 2.75 mph were rounded to 2.5 mph. This was because emission rates for speeds of 2.5 mph or less were the same, as described in the Processed Emission Rates section.

Time Periods

The TDM model provides aggregated data for 10 blocks of time for a day, not hour by hour—see the "name" column below. The data for these TDM periods were recategorized/interpolated into data for discrete clock hours 1-24 based on methodology from APCD.

The PeriodHour24 table below was used to split the TDM data for different time periods (AM1, PM2, OP1, etc.) into 24 clock hour time periods. VMT was calculated for each combination of integer speed (2.5 – 75mph), interstate (yes or no), road functional class (1-8), rural (yes or no), periodCog (1-10), and county.

The periodCog 1-10 were related to hours 1-24 as shown in the "hour" column. That provided a VMT per clock hour for each combination of speed and functional class. This was used to relate the VMT to fractions of VMT by HPMS per functional class and hour.

The cVMT was divided by the number of "periods" corresponding with each clock hour to calculate the VMT.

PeriodHour24

Interval	periodCog	name	hour	hrsT	periods
11:00 PM - 6:30AM	7	Op1.bin	1	7.5	7
11:00 PM - 6:30AM	7	Op1.bin	2	7.5	7
11:00 PM - 6:30AM	7	Op1.bin	3	7.5	7
11:00 PM - 6:30AM	7	Op1.bin	4	7.5	7
11:00 PM - 6:30AM	7	Op1.bin	5	7.5	7
11:00 PM - 6:30AM	7	Op1.bin	6	15	7
6:30-7:00 AM	1	Am1.bin	7	1	1
7:00-8:00 AM	2	Am2.bin	8	1	1
8:00-9:00 AM	3	Am3.bin	9	1	1
9:00 AM - 11:30 AM	8	Op2.bin	10	2.5	2.5
9:00 AM - 11:30 AM	8	Op2.bin	11	2.5	2.5
	9	Op3.bin	12	3.5	7
	8	Op2.bin	12	2.5	5
11:30 AM - 3:00 PM	9	Op3.bin	13	3.5	3.5
	9	Op3.bin	14	3.5	3.5
	9	Op3.bin	15	3.5	3.5
3:00-5:00 PM	4	Pm1.bin	16	2	2
3:00-5:00 PM	4	Pm1.bin	17	2	2
5:00-6:00 PM	5	Pm2.bin	18	1	1
6:00-7:00 PM	6	Pm3.bin	19	1	1
7:00-11:00 PM	10	Op4.bin	20	4	4
7:00-11:00 PM	10	Op4.bin	21	4	4
7:00-11:00 PM	10	Op4.bin	22	4	4
7:00-11:00 PM	10	Op4.bin	23	4	4
11:00 PM - 6:30AM	7	Op1.bin	24	7.5	7

Fraction of VMT by HPMS

Once VMT was calculated for each road functional class and clock hour, the fractions of VMT by HPMS for each corresponding functional class and clock hour were applied. This calculated the VMT for HPMS 10-60. The fractions used were from APCD and were consistent with their methodology.

FractionsByHourHPMSnaaT

NAA?	Weld?	Rural?	FC	Hr	10f	20f	30f	40f	50f	60f
-1	W	R	1	1	1.12494375281236E-03	0.442984079764564	0.408981870287873	8.24958752062397E-04	3.60606876834793E-03	0.14247807867434
-1	W	R	1	2	6.50325162581291E-04	0.418107821883677	0.388118179039889	1.40070035017509E-03	5.57032759041272E-03	0.186152645973265
-1	W	R	1	3	1.1907462009526E-03	0.402448608970853	0.376594285267901	1.9278748015423E-03	8.86488378110699E-03	0.208973600977645
-1	W	R	1	4	1.88772529102432E-03	0.400795540811441	0.375296865809669	3.5956672209987E-03	8.74568726325532E-03	0.209678513603612
-1	W	R	1	5	1.27600843728028E-03	0.438002933384539	0.406922735865401	8.59352621025494E-04	5.91653137282429E-03	0.14702243831893
-1	W	R	1	6	9.86892049192773E-04	0.462978652961131	0.429325812630245	1.88521686320158E-03	5.20852159466524E-03	9.96149039015637E-02
-1	W	R	1	7	8.56477631797771E-04	0.47063947538398	0.437825973989187	1.19740562115417E-03	7.50554404406707E-03	8.19751233298142E-02

Road Types

The TDM used roadway functional classes that were recategorized to MOVES road types. That allowed the road types from the TDM to be related to the emission rates.

RTt

DRCOG Facil	FHWA facility type	rural?	FHWA	Urban	MOVESrt	fhwaRT	fcCode	Intestate
1	Principal Arterial - Interstate	-1	R	R	2	1	1	1
1	Principal Arterial - Interstate	-1	R	R	2	1	1	0
1	Principal Arterial - Interstate	0	N	U	4	11	1	0
1	Principal Arterial - Interstate	0	N	U	4	11	1	1
2	Principal Arterial - Other	-1	N	R	3	2	2	0
2	Principal Arterial - Other Freeways or Expresswa	0	N	U	4	12	2	0
3	Principal Arterial - Other	-1	N	R	3	2	3	0
3	Principal Arterial - Other	0	N	U	5	14	3	0
4	Minor Arterial	-1	N	R	3	6	4	0
4	Minor Arterial	0	N	U	5	16	4	0
5	Major Collector	-1	N	R	3	7	5	0
5	Collector	0	N	U	5	17	5	0
6	Principal Arterial	-1	R	R	2	1	1	0
6	Principal Arterial	0	N	U	4	11	1	0
8	Local System	-1	N	R	3	9	7	0
8	Local System	0	N	U	5	19	7	0

Filter by Geography/Region

The statewide GHG inventory was filtered to contain VMT for all counties in Colorado except for the nine-county region in the ozone non-attainment area. The nine counties excluded were Adams, Arapahoe, Boulder, Broomfield, Denver, Douglas, Jefferson, Larimer, and Weld. The statewide results were subdivided further into Pikes Peak area and the rest of the state.

Emissions Inventory

The processed emission rates table and the processed VMT table were related by road type, HPMS type, hour, and speed. This relate was used to multiply the emission rate (g/mi) by the VMT (mi) to get a total in grams of CO2e for an average weekday. The formula used was:

- CO2e (g/day) = SUM(Emission Rate (g/mi) * VMT (mi))
- CO2e (MMt/day) = CO2e (g/day) * 1 (MMt) / 1e+12 (g)
- CO2e (MMt/year) = CO2e (MMt/day) * 338 (TDM weekdays/calendar year)

The calculated emissions inventory was for on-road emissions. Non-road emissions were not included in this calculation.

References

EPA. 2016. *Using MOVES for Estimating State and Local Inventories of On-road Greenhouse Gas Emissions and Energy Consumption*. June. https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100OW0B.pdf

PTV GROUP
the mind of movement

Pikes Peak Travel Demand Model Update

PTV Group in cooperation with the Pikes Peak Area Council of Governments updated the multimodal tour-based travel demand model that represents travel activity in the region. This model update also enhanced the model with the addition of a work from home variable in the tour generation step and a 24hr dynamic traffic assignment model. The dynamic assignment model is a regional scale mesoscopic traffic simulation with more than 700 signalized intersections. The base year for the model is set to 2020.

This transportation planning model is a tour-based model and is a representation of the Colorado Springs area transportation facilities and multimodal travel patterns using these facilities. The model contains inventories of the existing roadway facilities, transit lines, synthetically generation population at the household and person level, as well as land use data such as workers, student enrollment, shopping, employment etc. in the area. The travel demand model was calibrated to reflect average daily traffic on roadway facilities. Further, hourly traffic counts were used to calibrate hourly travel demand for the purpose of dynamic traffic assignment.

The model can be used to measure the impact and evaluate scenarios such as changes in population, employment centers, travel behavior patterns, or roadway improvements. The transportation engineer or planner, using the transportation planning model, can project future traffic volumes without the cost of building inappropriate roadways or waiting for traffic congestion to severely impact travelers.

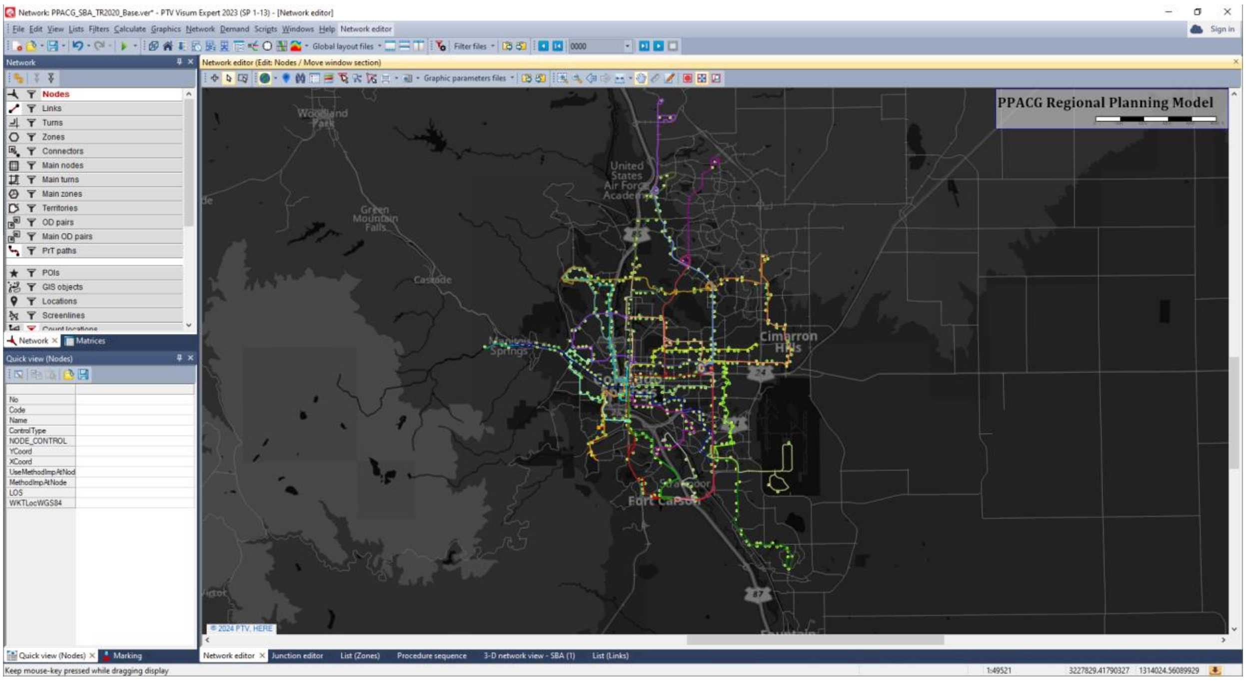
The model was developed using VISUM 2024. VISUM is a Windows based multimodal transportation modeling software and has an array of features implemented in an easy-to-use graphical user interface, thereby making it a very powerful analysis tool for transportation modeling and planning.

This document details the methodology that was used to develop the model. Because modeling is a complex process, much of the theory, terminology, and concepts are also discussed.

1. Model Area Identification

The model area contains El Paso County, Colorado Springs, Manitou Springs, Woodland Park, Green Mountain Falls, Fountain, Palmer Lake and Monument. The major through route in the area is I-25. The route runs in a north-south direction, with Denver in the north and Pueblo in the south. A snapshot of the model area is shown in Figure 1

Figure 1: Travel Demand Model Area – Pikes Peak Area Model



2. *Network Development*

The updated model network is multi-resolution in structure. Here, the level of detail used in the network assignments can be increased or decreased based on the network assignment method. The static assignment uses a typical link-node structure and applies turn prohibitions and macroscopic volume delay functions to model volume-based network delay. The simulation-based assignment (SBA) uses intersection geometry details and intersection control including signal timings and stop/yield control.

Network development for the model involved the following items:

1) Street network development – lanes, speeds, intersection geometries, signal timings etc.
2) Transit network development – transit lines with related timetable and headway data.
3) Transportation analysis zone refinement and updated centroid connectors.

2.1 Street Network Development

The street network for the model was developed by refinement of the existing travel demand model network using GIS layers and aerial imagery. The roadway classes, speeds, capacities and number of lanes were checked and updated in the entire network. In addition, intersection control, geometry and signal timings were added to the network to represent intersection level delay more accurately for the purpose of dynamic traffic assignment.

The following roadway functional classifications were used for modeling link delays in the model:

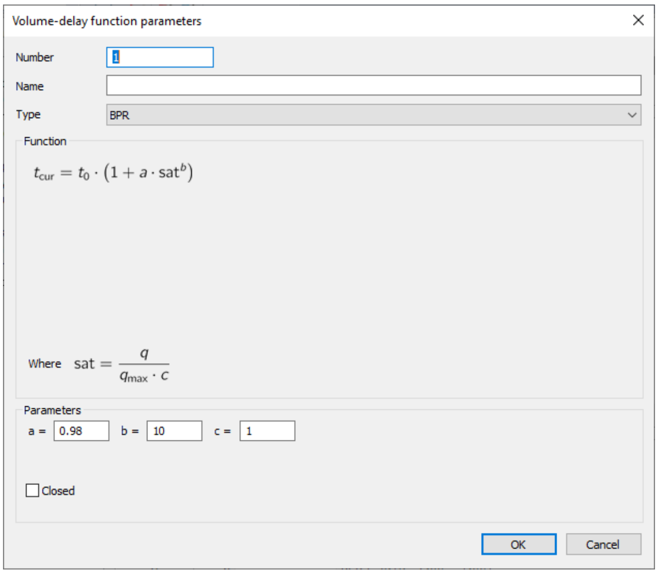
Table 1: Model Link Classification

Type No	Class No	Class Name	Capacity (/hr/ln)	Speed	Delay Function
10	1	Interstate HOV Connection	1500	65	1
11	1	Interstate	2400	80	1
12	1	Interstate	2400	75	1
13	1	Interstate	2400	70	1
14	1	Interstate	2350	65	1
15	1	Interstate	2300	60	1
16	1	Interstate	2250	55	2
17	1	Interstate HOV	1500	75	1
18	1	Interstate HOV	1500	70	1
19	1	Interstate HOV	1500	65	2
20	2	Expressway	2000	65	3
21	2	Expressway	2000	60	3
22	2	Expressway	1850	55	4
23	2	Expressway	1700	50	4
24	2	Expressway	1550	45	4
25	2	Expressway	1500	40	5
26	2	Expressway	1450	35	8
27	2	Expressway	1400	30	9
28	2	Expressway	1350	25	10
29	2	Expressway	1850	70	1
30	3	Principal Arterial	1800	65	4
31	3	Principal Arterial	1800	60	4
32	3	Principal Arterial	1800	55	5
33	3	Principal Arterial	1200	50	5
34	3	Principal Arterial	1000	45	6
35	3	Principal Arterial	900	40	7
36	3	Principal Arterial	850	35	8
37	3	Principal Arterial	800	30	9
38	3	Principal Arterial	800	25	10
40	4	Minor Arterial	1000	55	4
41	4	Minor Arterial	1000	50	5
42	4	Minor Arterial	850	45	6
43	4	Minor Arterial	850	40	7
44	4	Minor Arterial	750	35	8
45	4	Minor Arterial	700	30	9
46	4	Minor Arterial	700	25	10
47	4	Minor Arterial	650	20	10
48	4	Minor Arterial	650	15	10

Type No	Class No	Class Name	Capacity (/hr/ln)	Speed	Delay Function
49	4	Minor Arterial	1000	65	1
50	5	Collector	850	55	5
51	5	Collector	850	50	5
52	5	Collector	650	45	6
53	5	Collector	650	40	7
54	5	Collector	650	35	8
55	5	Collector	650	30	9
56	5	Collector	650	25	10
57	5	Collector	600	20	11
58	5	Collector	600	15	11
59	5	Collector	600	10	11
60	6	Residential	600	35	8
61	6	Residential	600	30	9
62	6	Residential	550	25	10
63	6	Residential	550	20	11
70	7	Ramp	1250	60	3
71	7	Ramp	1200	55	4
72	7	Ramp	1200	50	5
73	7	Ramp	1200	45	6
74	7	Ramp	1200	40	7
75	7	Ramp	1200	35	8
76	7	Ramp	1000	30	9
77	7	Ramp	1000	25	10
78	7	Ramp	1000	20	11
79	7	Ramp	1000	15	12

The above link capacities were applied in the network in combination with BPR volume delay functions to capture volume to capacity-based delay. The functional form is shown in the Figure 2 below.

Figure 2: Link Volume Delay Function for the PPACG Model



Six parameter sets were used in the model. These are shown in the table below:

Table 2: BPR Volume Delay Function Parameters

Delay Function No	BPR_a	BPR_b
1	0.98	10.0
2	0.93	8.0
3	1.00	5.4
4	0.83	2.7
5	0.71	2.1
6	0.15	7.0
7	0.15	7.0
8	0.15	7.0
9	0.15	7.0
10	0.15	7.0
11	0.15	7.0
12	0.15	7.0
13	0.15	7.0

2.2 Transit Network Development

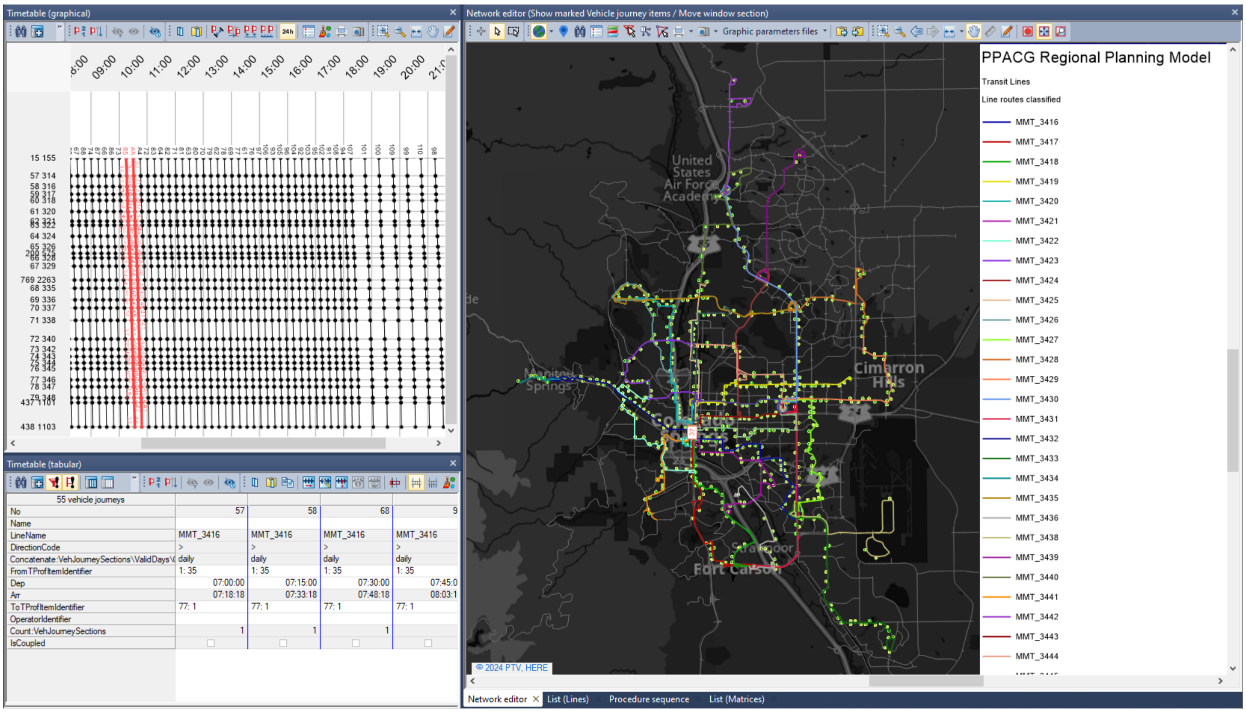
The PPACG tour-based model is designed as a 24-hour model with user defined time of day outputs. As a result, the network from the previous version of the model was completely replaced with a high-resolution transit network based on General Transit Feed Specification (GTFS). This network contains detailed timetable information suitable for timetable-based assignment and other operational analyses related to transit. While the existing model does not use timetable-based transit assignment, storing a timetable allows calculation of transit isochrones by time of day. This is useful in obtaining more realistic measures of transit accessibility and timed transfer connections at a disaggregated level.

A summary of transit lines included in the base model is presented in the table below.

Table 3: Base Model Transit Lines

LINE NAME	ROUTE_ID	ROUTE_NAME	TSYSNAME
MMT_3416	1	Hillside - Hancock Plaza	Bus
MMT_3417	10	Hwy 115 - PPSC	Bus
MMT_3418	11	World Arena - PPSC	Bus
MMT_3419	12	Palmer Park Blvd	Bus
MMT_3420	14	Chestnut St - G.O.G. Rd	Bus
MMT_3421	15	FOUNTAIN BLVD -E CHEYENNE MTN BLVD	Bus
MMT_3422	16	Brookside - Uintah Gardens	Bus
MMT_3423	17	19TH STREET/FILLMORE	Bus
MMT_3424	18	Union Blvd	Bus
MMT_3425	19	WEBER - EAGLE ROCK	Bus
MMT_3426	2	CENTENNIAL BLVD - G.O.G. Rd	Bus
MMT_3427	22	SOUTHBOROUGH VIA MURRAY BLVD	Bus
MMT_3428	23	Barnes Rd. - Tutt Blvd	Bus
MMT_3429	24	Galley Rd - Tutt Blvd	Bus
MMT_3430	25	N. ACADEMY BLVD - VOYAGER	Bus
MMT_3431	27	S. ACADEMY BLVD - PPSC	Bus
MMT_3432	3	COLORADO AVE - MANITOU	Bus
MMT_3433	32	SECURITY/WIDEFIELD	Bus
MMT_3434	33	INCLINE/COG SHUTTLE	Bus
MMT_3435	34	GOG/AUSTIN BLUFFS PKWY	Bus
MMT_3436	35	LAS VEGAS ST/ PPSC	Bus
MMT_3438	37	Amazon/ Airport	Bus
MMT_3439	38	UNION/ CHILDRENS HOSPITAL	Bus
MMT_3440	39	CORPORATE DR - VOYAGER PKWY	Bus
MMT_3441	4	S. 8th STREET - BROADMOOR	Bus
MMT_3442	40	VOYAGER - RAMPART PPSC	Bus
MMT_3443	5	Boulder - Citadel	Bus
MMT_3444	6	FILLMORE - Citadel	Bus
MMT_3445	7	Pikes Peak Ave. - Citadel	Bus
MMT_3446	8	Cache La Poudre - Citadel	Bus
MMT_3447	9	NEVADA - UCCS	Bus
MMT_3448	ZEB	ZEB Downtown Shuttle	Bus

Figure 3: GTFS Based Transit Network for the PPACG Model



2.3 Transportation Analysis Zone Refinement

The original TAZ system for the PPACG model was reviewed and revised to better align with census boundaries and roadway infrastructure. The updated TAZ system consists of 945 zones out of which 11 zones are external stations. The traffic and transit loading points or connectors were also redefined and placed as appropriate. The same loading scheme is used in both static and dynamic network assignments. The updated TAZ system for the PPACG Tour Based Model is illustrated below.

Figure 4: Updated TAZ System for the PPACG Model

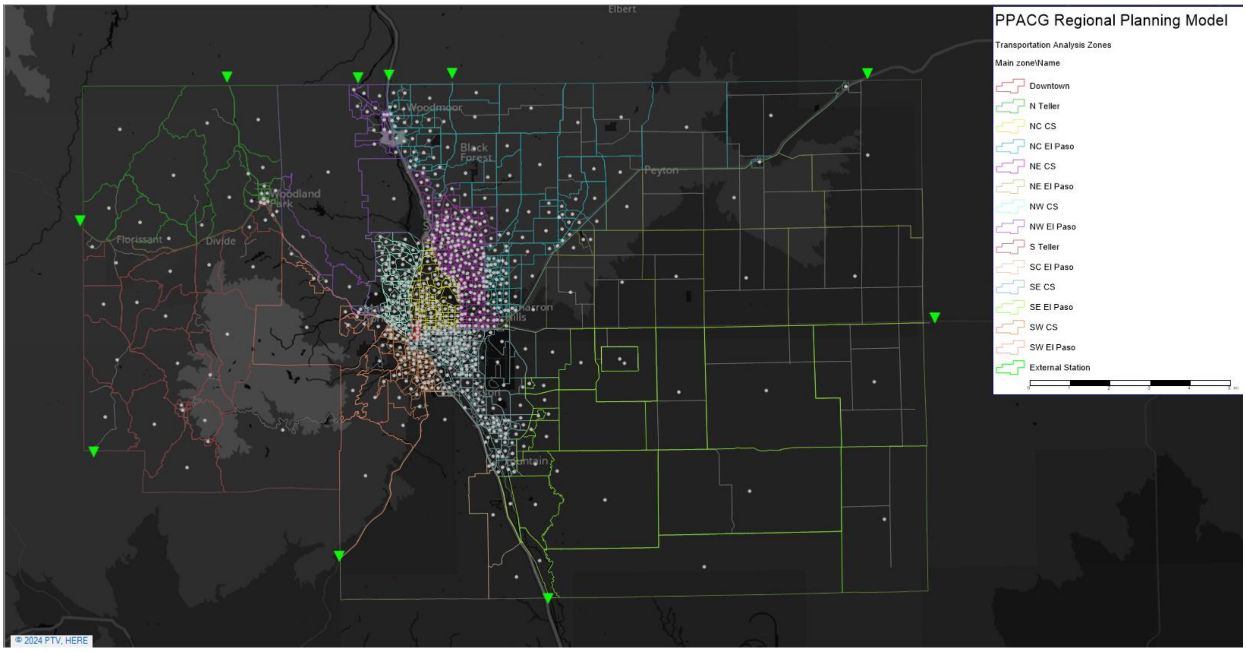


Table 4: PPACG TAZ System Summary

District	Number of Zones
Downtown	72
N Teller	19
NC CS	100
NC El Paso	129
NE CS	182
NE El Paso	14
NW CS	79
NW El Paso	22
S Teller	26
SC El Paso	8
SE CS	183
SE El Paso	23
SW CS	62
SW El Paso	15
External Station	11
TOTAL	**945**

2.4 Land Use Data

The land use and demographic data for the tour-based model was developed from multiple sources. The MPO provided the population and employment cross-sections. Additionally, the land use data related to zone level employment, shopping, recreation and student enrollment was derived from GIS data maintained by the MPO.

2.5 Demographic Data – Population Synthesis

The PPACG model uses a disaggregate synthetic population. The population synthesis process generates household weights for the seed sample that satisfies the marginal distributions. The final weights are then used to expand the seed sample into a disaggregate synthetic population. The use of a synthetic population allows greater flexibility in modeling tour and trip making characteristics by various demographic cross-sections and incorporation of variables to model work-from-home situations in a more robust and flexible manner.

With the advancement of travel demand models in recent years, synthetic population generation has also received research attention. Traditional population synthesizers used Iterative Proportional Fitting (IPF) or Iterative Proportional Updating (IPU) methods while advanced population synthesizers use optimization-based techniques such as entropy maximization and linear programming. PopulationSim[1] is a state-of-the-art population synthesizer software originally developed for the Oregon Department of Transportation (ODOT) and its partner agencies. PopulationSim is an open software developed in the ActivitySim[2] framework and is currently managed by the ActivitySim consortium. PopulationSim offers many technical and usability enhancements over other population synthesizers.

[1] PopulationSim: https://activitysim.github.io/populationsim/
[2] ActivitySim: https://activitysim.github.io/

PopulationSim makes several advancements over traditional population synthesizers such as PopSyn3 and PopGen. These include enhancements resulting from the use of advanced optimization methods, unique features for travel demand model applications, efficient software design, and better interfacing with PTV Visum. The following sub-sections describe these benefits in more detail.

Algorithmic advantages

PopulationSim uses an entropy maximization-based list-balancing approach for generating weights[3]. The entropy-maximization formulation results in uniform weights that are not expanded beyond a user-defined threshold. The uniformity in weights ensures that the distribution of uncontrolled variables is not significantly changed in the process. This unique formulation also allows for the specification of importance factors on each marginal control. The user can set these factors in accordance with their confidence in the quality of the data.

Another important advantage of the PopulationSim algorithm is that it operates simultaneously on all geographic units. This eliminates the errors resulting from the sequential processing of geographies. This is a known problem in the PopSyn3 population synthesizer which results in poor control match for minority population segments such as university students or low-income households. The simultaneous list balancing method used in PopulationSim eliminates this type of error and results in better control match for minority population segments.

Generally, the list balancing or IPF-based process generates floating-point weights. However, for expanding the seed sample, integer weights are required. Many traditional population synthesizers resort to simple or bucket rounding of floating-point weights. This method results in poor control matches and the errors can accumulate over geographic units. Some IPF-based population synthesizers such as PopGen rely on Monte-Carlo draws from a joint distribution of floating-point weights. Again, the Monte-Carlo errors can accumulate and result in poor marginal control matches. PopulationSim uses a linear programming (LP) formulation to convert floating-point weights to integers. As a result, PopulationSim avoids rounding or drawing errors in contrast to other population synthesizers.

Advanced usability features

PopulationSim also offers several unique features that make it a practical choice for many travel demand model applications. These features are described below:

- Person controls

PopulationSim allows the specification of both household and person-level controls. While most population synthesizers offer this feature, some of the traditional ones operate only at the household level.

- Multiple geographies

As stated earlier, the main inputs to the population synthesis process are a seed sample and marginal controls. Typically, most population synthesizers operate at a single geographic level. However, data for marginal controls are generally not available at the same geographic level. For example, the household income distributions may be available at the Traffic Analysis Zone (TAZ) level and the person age distribution might be available at the County level. The available data needs to be transformed to the

[3] See TRB Paper for more details:
https://github.com/ActivitySim/populationsim/blob/master/papers/TRB_Paper_PopulationSim_v6.pdf

same geographic level which can be a time-consuming task and can introduce approximation errors. In contrast, PopulationSim can use data available at multiple geographic levels without any transformation.

- Importance factors for controls

As stated earlier, PopulationSim also allows users to specify importance factors on each control. The PopulationSim algorithm gives higher priority to marginal controls with a higher importance factor. This feature can be very useful in a situation where the user places a higher level of confidence in a certain data source.

- Re-populate feature

Typical model applications for a regional model include corridor studies and traffic impact studies, which require carefully controlled baseline versus build analysis. PopulationSim software offers functionality that supports this type of analysis; a 're-populate' mode in the software adds to or replaces the existing synthetic population in a subset of zones using whatever controls the user is able to provide (for example, households by type).

Software benefits

As mentioned earlier, PopulationSim has a robust open-source software implementation in the ActivitySim framework. Software development adheres to software engineering best practices. The system is under continuous integration (CI), which means the software and documentation are automatically built and tested against sample datasets to ensure that new features do not break the code base for any users. PopulationSim benefits arising from its robust software design are described below:

- Runtime

The Python-based ActivitySim framework makes heavy use of the Numpy and Pandas Python libraries, which allow for the vectorization of operations to reduce overall runtime. This in conjunction with an optimization-based algorithm achieves faster convergence for PopulationSim. Runtime comparison between PopGen and PopulationSim for DVRPC and NFTPO showed significant runtime improvements.

- ActivitySim framework

The software depends on the ActivitySim core and therefore offers the same user experience as the ActivitySim activity-based model, namely the same user interface, customizable expressions, approach to tracing calculations, and data management.

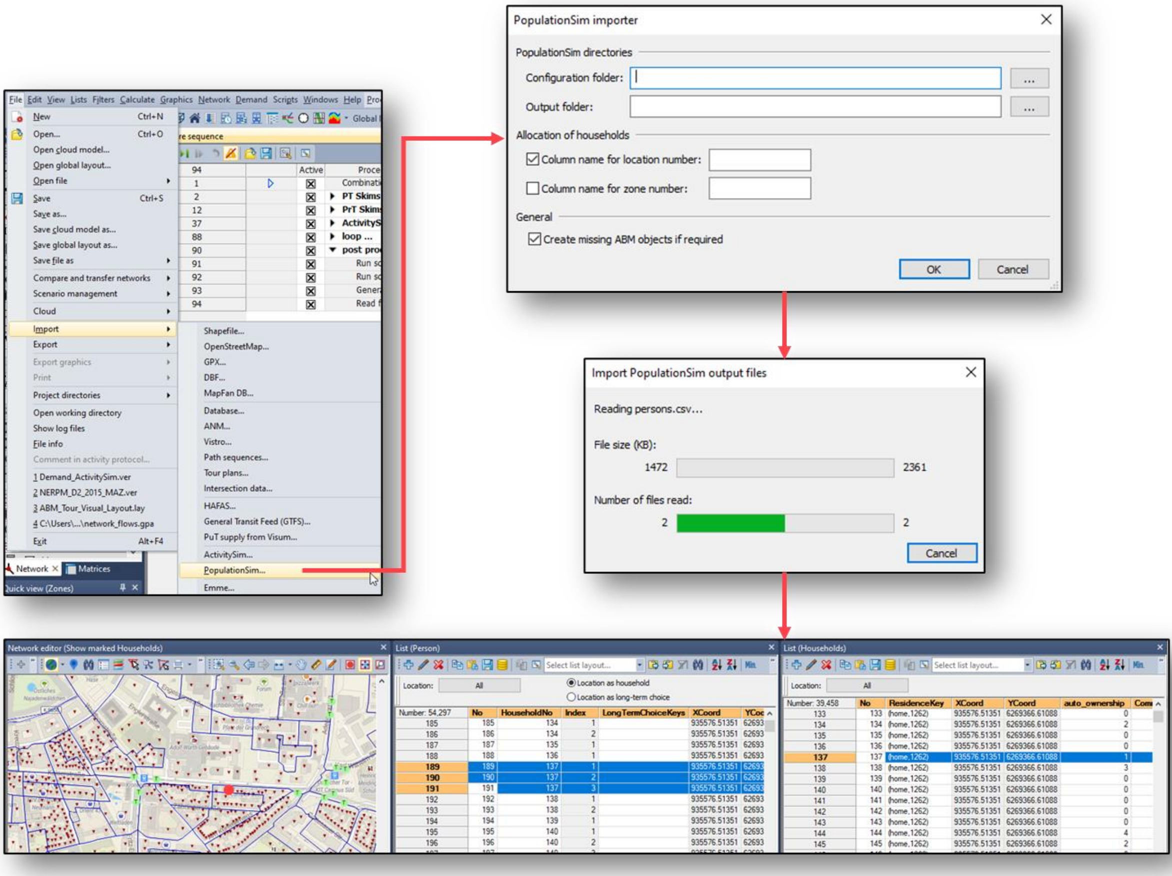
- Documentation and support

The PopulationSim source code and technical documentation are available at the following public GitHub repository: https://github.com/ActivitySim/populationsim. The technical documentation includes runnable examples and training resources. PopulationSim enjoys a large user community in the US and worldwide. The users can report bugs and issues on the GitHub repository and contribute to the software development.

Integration with PTV Visum

Visum now includes person and household Network Objects to house synthetic populations. Visum's Python API or the GUI-based menu option can be used to import PopulationSim-generated synthetic population. The user points Visum to an existing PopulationSim setup. The import procedure reads the outputs into Visum and creates network objects as needed.

Figure 5: PTV Visum PopulationSim Import Procedure



The list of land use and demographic variables used in the model is given in the Appendix.

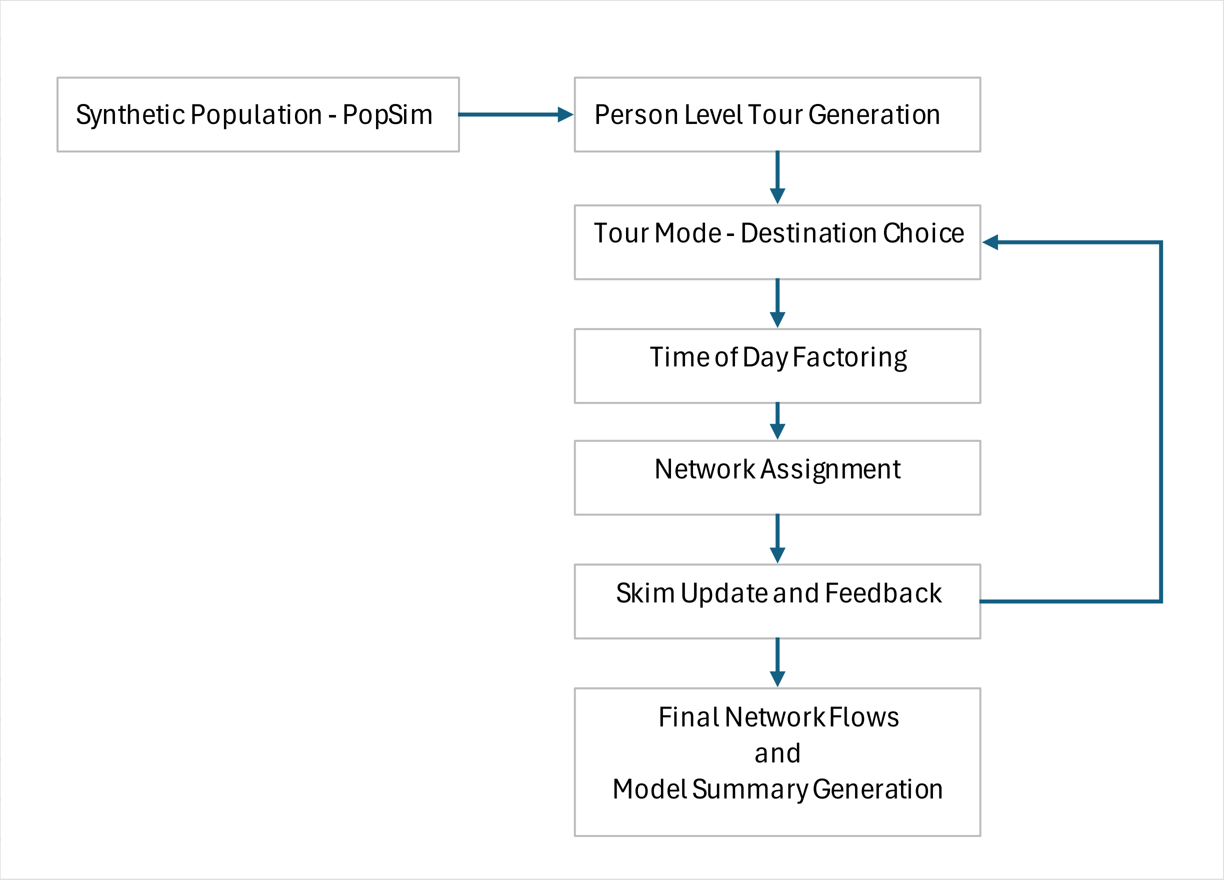
3. Model Approach

The tour-based model structure adopted in Visum is based on a hybrid modeling methodology which explicitly models person tour generation at the individual level and combined mode-destination and time of day choice of homogeneously divided person types at an aggregated zonal level. It involves execution of the following procedures:

1) Tour generation
2) Tour destination choice – with and without rubber banding
3) Tour mode choice – with primary mode choice or leg-by-leg mode choice
4) Time of day calculation – based on trip level time of day factors derived from survey data

The three logical units (mode-destination-time of day choice) are processed simultaneously during the model calculation.

Figure 6: PPACG Tour Based Model Calculation Flow



3.1 Tour Generation

Tour generation (calculating and applying skeletal tour/activity patterns by person type): In the hybrid modeling approach, tour generation is calculated at the person level using a range of person and household attributes. Subsequently, the person level results are aggregated into a set of broader person groups which are used to summarize model results and application of mode-destination and time of day models.

Table 5: PPACG Model Person Groups

CODE	NAME
Worker_GCP	General, Clerical and Professional Workers
Worker_MCT	Manufacturing, Construction and Trades Workers
Worker_MIL	Military Workers

NonWorker	Non-Workers under 65
Senior	Non-Workers 65 and above
Student_Elem	Student Elementary School
Student_High	Student High School
Student_Univ	Student College University

The updated tour generation model incorporates a work-from-home model to accommodate the impact of new work-from-home trends seen after the COVID19 pandemic. The approach used in the PPACG tour generation model to account for work-from-home policies is applied as a post-processing step in tour generation that scales the base tour generation to produce updated tour frequencies for each worker in the synthetic population.

In the first step, a mobility rate is calculated for each person and tour type combination. To calculate mobility rates, daily activity chains derived from a travel survey are broken down into individual home-based tours. Distinct tour types are identified among the complete set of tours and their corresponding probability is calculated. As a result, the sum of the probabilities of a person group can be greater than 1.0 (or 100 %), because a person can execute multiple tours one after the other in a day (for example: first HWH, then HOH).

Consider for example the daily activity chains 5 persons below:

HWH, HWH, HWOH, HWHOH, HOHWH

In the above case, mobility rates for home-based tours (HWH, HWOH, HOH) tours are calculated by counting their occurrence in each of the daily activity chains and dividing it by the total number of daily activity chains.

This produces a mobility rate of 0.8 [4/5] for HWH, a mobility rate of 0.4 [2/5] for HOH and a mobility rate of 0.2 [1/5] for HWOH tours.

Mobility rate extraction from the travel diary coarsely involves the steps below,

1) Extraction of raw chains or daily patterns for each person type

2) Determining unique home-based tours within the chains

3) Counting the occurrence of each tour type in the list of all chains and dividing by the number of activity chains.

The base mobility rates for each person group and tour type derived from the PPACG travel survey are tabulated below. Activities in the tour chain are represented as: H-Home, W-Work, D-Stop on work/school, O-Non-work.

Table 6: Tour Mobility Rates by Person Type

NO	TOUR	WORKER GCP	WORKER MCT	WORKER MIL	NON-WORKER	SENIOR	STUDENT ELEM	STUDENT HIGH	STUDENT UNIV
1	HDDDWDDDH	0	0	0	0	0	0	0	0
2	HDDDWDDH	0	0	0	0	0	0	0	0
3	HDDDWDH	0	0	0	0	0	0	0	0
4	HDDDWH	0.01	0.01	0	0	0	0	0	0
5	HDDSDDH	0	0	0	0	0	0	0.01	0.01
6	HDDSDH	0	0	0	0	0	0	0	0
7	HDDSH	0	0	0	0	0	0	0	0
8	HDDWDDDH	0	0.01	0	0	0	0	0	0
9	HDDWDDH	0	0	0	0	0	0	0	0
10	HDDWDH	0.01	0.01	0	0	0	0	0	0
11	HDDWH	0.01	0	0.01	0	0	0	0	0
12	HDSDDH	0	0	0	0	0	0.01	0	0.01
13	HDSDH	0	0	0	0	0	0.05	0.05	0.01
14	HDSH	0	0	0	0	0	0.03	0.06	0.01
15	HDWDDDH	0.02	0.02	0.02	0	0	0	0	0
16	HDWDDH	0.02	0.01	0.02	0	0	0	0	0
17	HDWDH	0.03	0.01	0.06	0	0	0	0	0
18	HDWH	0.05	0.03	0.04	0	0	0	0	0
19	HOH	0.44	0.41	0.25	0.67	0.55	0.38	0.26	0.44

NO	TOUR	WORKER GCP	WORKER MCT	WORKER MIL	NON-WORKER	SENIOR	STUDENT ELEM	STUDENT HIGH	STUDENT UNIV
20	HOOH	0.16	0.12	0.09	0.26	0.22	0.12	0.05	0.15
21	HOOOH	0.07	0.04	0.03	0.1	0.06	0.04	0.05	0.06
22	HOOOOH	0.09	0.06	0.01	0.11	0.11	0.04	0.03	0.07
23	HSDDH	0	0	0	0	0	0.04	0.1	0.04
24	HSDH	0	0	0	0	0	0.08	0.12	0.03
25	HSH	0	0	0	0	0	0.42	0.5	0.22
26	HWDDDH	0.06	0.05	0.02	0	0	0	0	0
27	HWDDH	0.05	0.05	0.06	0	0	0	0	0
28	HWDH	0.08	0.07	0.07	0	0	0	0	0
29	HWH	0.4	0.5	0.5	0	0	0	0	0

In the second step, a person level work from home multinomial choice model is used to estimate the probability of a person working from home for a given number of days. This provides a scaling factor that is then applied to the 'base' work tour mobility rate for each person. The model coefficients for the telecommute frequency choice model were initially adopted from the SANDAG travel demand model and calibrated to the available remote-work data available in the travel survey. The coefficients adopted in the model are tabulated below.

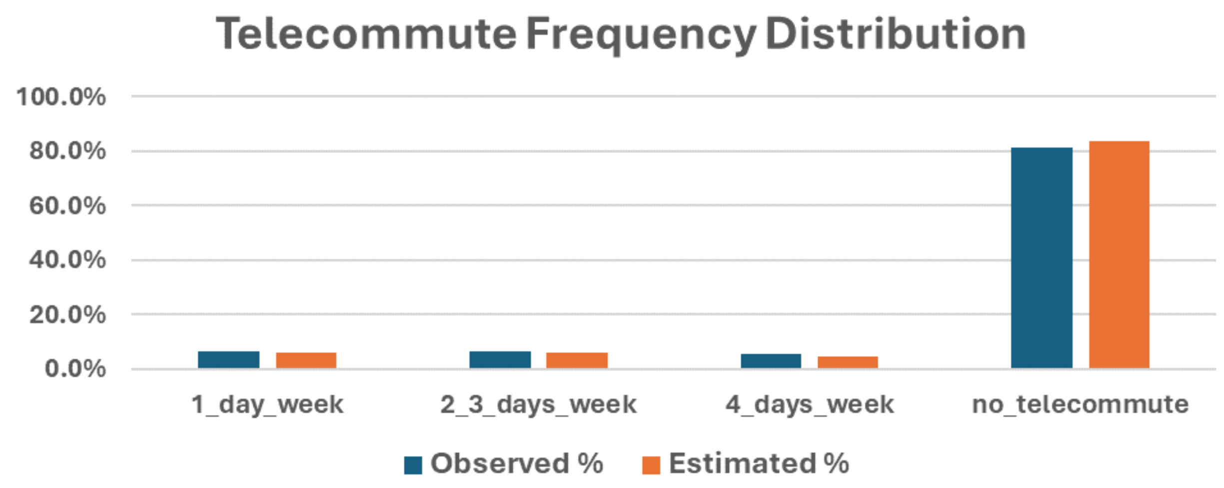
Table 7: Remote Work Choice Model Parameters

		Telecommute Alternative Coefficients			
No	**Variable**	**no_telecommute**	**1_day_week**	**2_3_days_week**	**4_days_week**
1	occp_Services	0	-1.62	-0.65	0
2	occp_SalesOffice	0	-0.62	-0.74	-0.89
3	occp_ResourceConstruct	0	-1.57	0	0
4	occp_TransportMat	0	-14.75	0	0
5	presenceOfChildren0_5	0	0	0	-0.86

		Telecommute Alternative Coefficients			
No	Variable	no_telecommute	1_day_week	2_3_days_week	4_days_week
6	presenceOfChildren6_12	0	0	0.52	-0.81
7	adultInHousehold_1	0	0.18	0	-0.04
8	adultInHousehold_ge2	0	0	0	0
9	female	0	0	0	0
10	partTimeWorker	0	0	0.42	1.11
11	univStudent	0	0	0.6	0
12	paysToPark	0	0.46	0	0
13	income_60_100k	0	0.56	0.39	0
14	income_100_150k	0	0.64	0.19	0
15	income_150k_pl	0	0.92	0.77	0
16	autos_0	0	0	0.41	0
17	autos_1	0	0	0	0
18	autos_ge3	0	0	-0.73	0
19	avgDistToWork	0	0.02	0	0
20	ASC	0	-3.62	-3.55	-4.57
21	CALIB_CONST	0	0.57	0.77	1.65

The framework above allows a flexible way to account for the impact of remote work policies on work related travel. This flexibility in the model is necessary because the remote work policies of employers are still evolving post-pandemic (COVID19). The tour generation mode considers that certain types of workers may not be able to work remotely due to the nature of their job (military, manufacturing, service). The models are thus applied based on workers classified by occupation types rather than income. The summaries for the base model are shown below.

Figure 7: Telecommute Model Validation



Observed	
TelecommuteFreq	**Workers**
1_day_week	16,052
2_3_days_week	16,903
4_days_week	14,198
no_telecommute	206,952
Total	254,104

Estimated	
TelecommuteFreq	**Workers**
1_day_week	18,899
2_3_days_week	19,344
4_days_week	14,270
no_telecommute	266,628
Total	319,141

Estimated Scaled	
TelecommuteFreq	**Workers**
1_day_week	18,899
2_3_days_week	19,344
4_days_week	14,270
no_telecommute	266,628
Total	319,141

Observed %	
TelecommuteFreq	**Percent**
1_day_week	6.3%
2_3_days_week	6.7%
4_days_week	5.6%
no_telecommute	81.4%
Total	100%

Estimated %	
TelecommuteFreq	**Percent**
1_day_week	5.9%
2_3_days_week	6.1%
4_days_week	4.5%
no_telecommute	83.5%
Total	100%

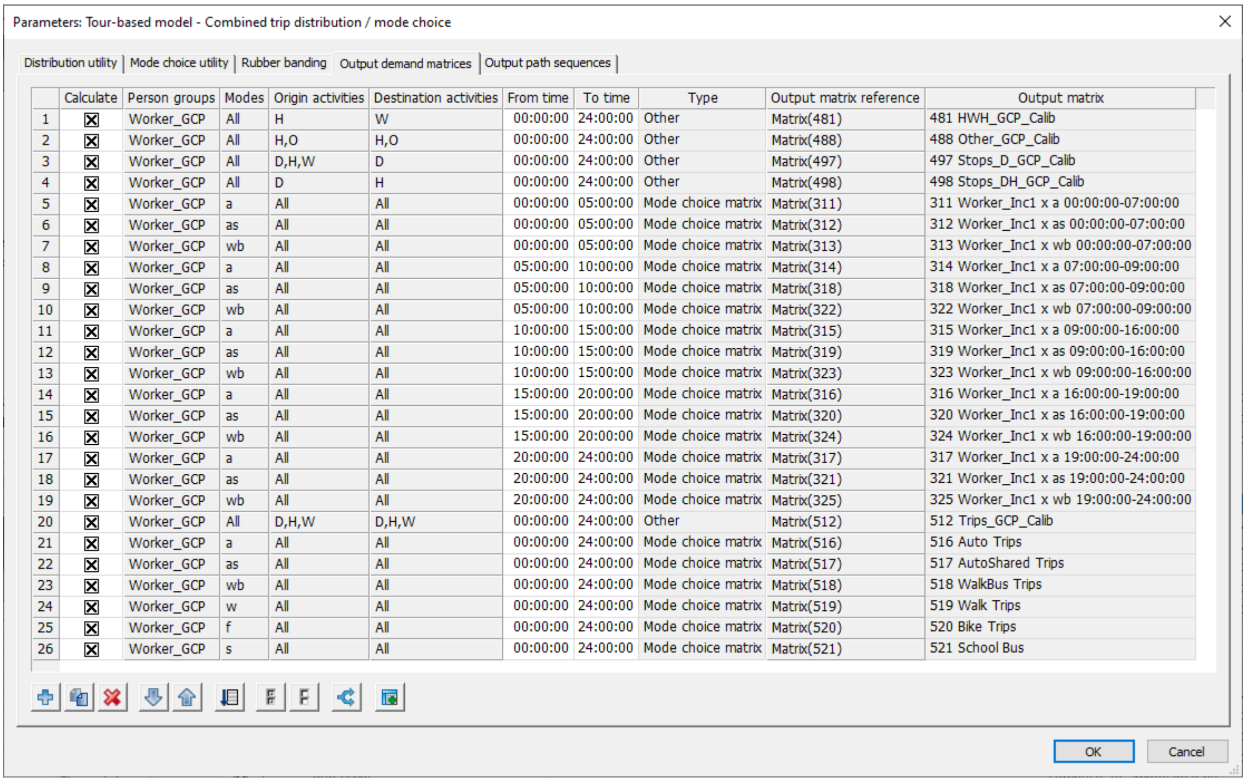
Table 8: Summary of Base Year Person Tours

Person Group	Persons	Work/School Tours	Other Tours	Total Tours
Worker_GCP	257,151	179,257	204,696	**383,952**
Worker_MCT	59,428	42,727	39,103	**81,829**
Worker_MIL	22,093	16,766	8,825	**25,591**
NonWorker	112,822	-	129,559	**129,559**
Senior	92,989	-	88,154	**88,154**
Student_Elem	143,255	91,617	84,293	**175,910**
Student_High	47,740	40,155	18,552	**58,706**
Student_Univ	47,864	15,679	34,857	**50,536**

3.2 Tour Based Destination and Mode Choice

Destination choice/trip distribution (determining the trip destination): The hybrid approach used in the PPACG model implements the tour-based destination choice at a zonal aggregate level. Modeling of tours considers non-home-based trips as part of a trip chain. This makes the non-home-based trips spatially consistent with the overall trip making in the system. Aggregate tour or trip chain calculations are implemented with matrix operations in a multi-threaded optimized framework. This removes the burden of complicated matrix management from the modeler. Instead, outputs can be specified by time of day and with a flexible combination of activities and modes.

Figure 8: Tour-based Destination-Mode Choice Output Specification


Parameters: Tour-based model - Combined trip distribution / mode choice

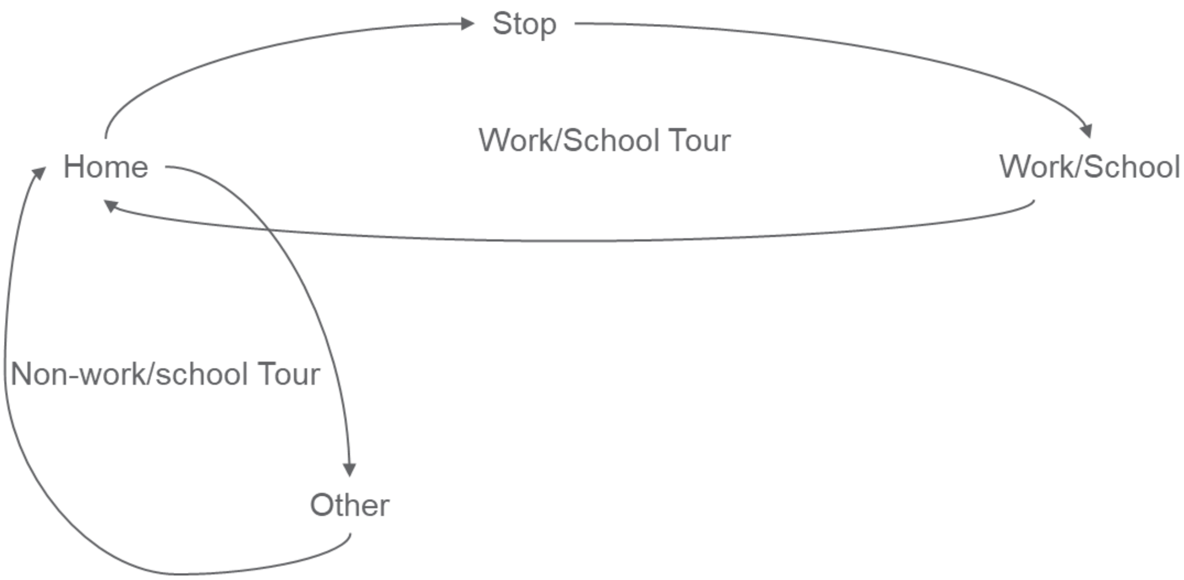
Distribution utility | Mode choice utility | Rubber banding | Output demand matrices | Output path sequences

	Calculate	Person groups	Modes	Origin activities	Destination activities	From time	To time	Type	Output matrix reference	Output matrix
1	☒	Worker_GCP	All	H	W	00:00:00	24:00:00	Other	Matrix(481)	481 HWH_GCP_Calib
2	☒	Worker_GCP	All	H,O	H,O	00:00:00	24:00:00	Other	Matrix(488)	488 Other_GCP_Calib
3	☒	Worker_GCP	All	D,H,W	D	00:00:00	24:00:00	Other	Matrix(497)	497 Stops_D_GCP_Calib
4	☒	Worker_GCP	All	D	H	00:00:00	24:00:00	Other	Matrix(498)	498 Stops_DH_GCP_Calib
5	☒	Worker_GCP	a	All	All	00:00:00	05:00:00	Mode choice matrix	Matrix(311)	311 Worker_Inc1 x a 00:00:00-07:00:00
6	☒	Worker_GCP	as	All	All	00:00:00	05:00:00	Mode choice matrix	Matrix(312)	312 Worker_Inc1 x as 00:00:00-07:00:00
7	☒	Worker_GCP	wb	All	All	00:00:00	05:00:00	Mode choice matrix	Matrix(313)	313 Worker_Inc1 x wb 00:00:00-07:00:00
8	☒	Worker_GCP	a	All	All	05:00:00	10:00:00	Mode choice matrix	Matrix(314)	314 Worker_Inc1 x a 07:00:00-09:00:00
9	☒	Worker_GCP	as	All	All	05:00:00	10:00:00	Mode choice matrix	Matrix(318)	318 Worker_Inc1 x as 07:00:00-09:00:00
10	☒	Worker_GCP	wb	All	All	05:00:00	10:00:00	Mode choice matrix	Matrix(322)	322 Worker_Inc1 x wb 07:00:00-09:00:00
11	☒	Worker_GCP	a	All	All	10:00:00	15:00:00	Mode choice matrix	Matrix(315)	315 Worker_Inc1 x a 09:00:00-16:00:00
12	☒	Worker_GCP	as	All	All	10:00:00	15:00:00	Mode choice matrix	Matrix(319)	319 Worker_Inc1 x as 09:00:00-16:00:00
13	☒	Worker_GCP	wb	All	All	10:00:00	15:00:00	Mode choice matrix	Matrix(323)	323 Worker_Inc1 x wb 09:00:00-16:00:00
14	☒	Worker_GCP	a	All	All	15:00:00	20:00:00	Mode choice matrix	Matrix(316)	316 Worker_Inc1 x a 16:00:00-19:00:00
15	☒	Worker_GCP	as	All	All	15:00:00	20:00:00	Mode choice matrix	Matrix(320)	320 Worker_Inc1 x as 16:00:00-19:00:00
16	☒	Worker_GCP	wb	All	All	15:00:00	20:00:00	Mode choice matrix	Matrix(324)	324 Worker_Inc1 x wb 16:00:00-19:00:00
17	☒	Worker_GCP	a	All	All	20:00:00	24:00:00	Mode choice matrix	Matrix(317)	317 Worker_Inc1 x a 19:00:00-24:00:00
18	☒	Worker_GCP	as	All	All	20:00:00	24:00:00	Mode choice matrix	Matrix(321)	321 Worker_Inc1 x as 19:00:00-24:00:00
19	☒	Worker_GCP	wb	All	All	20:00:00	24:00:00	Mode choice matrix	Matrix(325)	325 Worker_Inc1 x wb 19:00:00-24:00:00
20	☒	Worker_GCP	All	D,H,W	D,H,W	00:00:00	24:00:00	Other	Matrix(512)	512 Trips_GCP_Calib
21	☒	Worker_GCP	a	All	All	00:00:00	24:00:00	Mode choice matrix	Matrix(516)	516 Auto Trips
22	☒	Worker_GCP	as	All	All	00:00:00	24:00:00	Mode choice matrix	Matrix(517)	517 AutoShared Trips
23	☒	Worker_GCP	wb	All	All	00:00:00	24:00:00	Mode choice matrix	Matrix(518)	518 WalkBus Trips
24	☒	Worker_GCP	w	All	All	00:00:00	24:00:00	Mode choice matrix	Matrix(519)	519 Walk Trips
25	☒	Worker_GCP	f	All	All	00:00:00	24:00:00	Mode choice matrix	Matrix(520)	520 Bike Trips
26	☒	Worker_GCP	s	All	All	00:00:00	24:00:00	Mode choice matrix	Matrix(521)	521 School Bus

OK Cancel

The trip chaining within the tours is calculated in two modes – without rubber-banding (full-tours) and with rubber-banding (half-tours). The methodology for trip chain calculation is described in the next subsections.

Figure 9: Example Tour Types



Tours without Primary Activities

The tour-based destination choice is performed using the gravity/destination choice formulation shown below:

$$P_{ij}^{g} = \frac{Z_j . f(U_{ij}^{g})}{\sum_{k=1}^{N} Z_k . f(U_k^{g})}$$

Where,

P_{ij}^{g} *= Probability of destination/location choice.*

$f(U_{ij})$ = friction term with specified functional transformation on utility.

Zj = size term related to the destination activity.

If $f(U_{ij})$ is used with a logit function, the above equation becomes equivalent to:

$$P_{ij}^{g} = \frac{e^{U_{ij}^{g} + \ln(Z_j)}}{\sum_{k=1}^{N} e^{U_{ik}^{g} + \ln(Z_k)}}$$

Multiplying out the total number of tours with the above probabilities yields the number of trips along the tour leg. Each trip leg of the home-based tour is evaluated by successively applying the above formulation with each destination leg serving as the origin control for the next leg. As an example, a tour with the skeletal structure HOOH, will be calculated as a chain of matrix operations applied to each leg: HO-> OO->OH. The tour generation provides the initial control trip total for the first trip leg.

Tours with Primary Work/School Activities

Work and school tours are modeled using the concept of rubber-banding. Here, a primary destination governs the choice of mode as well as intermediate stop locations on work and school tours. Consider a tour with skeletal structure HSWH (Home-Stop-Work-Home). Since the primary activity in this tour is

Work (W), the chain is split into two half-tours: (1) HSW and (2) WH. The first half-tour HSW is calculated using the attraction size of the work activity as HW. The trips between H and W are then routed through potential stop locations by using the composite utility of the stop attraction size and friction factor of stop locations with respect to the two anchor locations (Home and Work).

Figure 10: Half Tour with Primary Work Destination and Intermediate Stop Location

A general consideration for the insertion of stop locations on primary tours is to minimize out of way travel between the primary activity locations (Home and Work/School). The stop location choice is thus based on the composite utility of the trip legs between the primary anchor locations and stop locations. The formulation for intermediate stop location choice is illustrated below:

$$P_{ik} = \frac{Z_k \times f(U_{ik}^{H\to S} + wU_{kj}^{S\to W})}{\sum_{m=1}^{n} Z_m \times f(U_{im}^{H\to S} + wU_{mj}^{S\to W})}$$

Where,

i=index of origin (home anchor)

j=index of primary destination (work/school)

k=index of intermediate stop location

Zk= size variable for stop location k

f = functional transformation | exp

U(HS), (SW) – utilities of traveling to destination thorough a given stop location

w = weight factor

Destination Choice Model Parameters

The activities considered in the PPACG model are tabulated below:

Activity Name	Activity Code	Anchor Activity
Stop on primary	D	No
Home	H	Yes

Other (Shop/Recreation/Non-work)	O	No
School	S	No
Work	W	No

The size variables used in the model are applied to each person group as a weighted sum of land use variables. The initial set of these weights were based on the SANDAG activity-based model. The weights were then systematically calibrated for the PPACG model to reflect local conditions.

		Land Use Variable												
Person Type	**Activity**	**EMP OFFICE**	**EMP RETAIL**	**EMP SRVC**	**EMP LABOR**	**EMP MIL**	**HH**	**EMENROLL**	**HS ENROLL**	**COLL ENROLL**	**EMP SRVC**	**EMP RETAIL**	**EMP OFFICE**	**EMP SRVC**
Senior/Non-Worker	Other	0	0.95	0.3	0	0	0.07	0	0	0	-0.25	-0.8	0	-0.25
Students	Other	0	0.95	0.3	0	0	0.07	0	0	0	-0.25	-0.85	0	-0.25
Workers	Other	0	0.95	0.3	0	0	0.05	0	0	0	-0.25	-0.8	0	-0.25
Elementary	School	0	0	0	0	0	0	1	0	0	0	0	0	0
High	School	0	0	0	0	0	0	0	1	0	0	0	0	0
Post Secondary	School	0	0	0	0	0	0	0	0	1	0	0	0	0
Workers (GCP/MCT)	Stop	0	0.95	0.3	0	0	0.05	0.1	0	0	-0.25	-0.8	0	-0.25
Workers (MIL)	Stop	0	0.95	0.3	0	0	0.05	0.1	0	0	0	0	0	-0.25
Students	Stop	0	0.95	0.25	0.1	0	0.03	0.05	0	0	-0.2	-0.85	0	-0.23
Workers (GCP)	Work	0.94	0.83	0.93	0.11	0	0	0	0	0	0	0	0	0

		Land Use Variable												
Person Type	Activity	EMP OFFICE	EMP RETAIL	EMP SRVC	EMP LABOR	EMP MIL	HH	EM EN ROL L	HS ENRO LL	COLL ENROL L	EMP SRVC	EMP RETAIL	EMP OFFICE	EMP SRVC
Workers (MCT)	Work	0.06	0.17	0.07	0.89	0	0	0	0	0	0	0	0	0
Workers (MIL)	Work	0	0	0	0	1	0	0	0	0	0	0	0	0

The impedance term in the destination choice model was adopted from the SANDAG model and uses the time, distance and various transformations over destination distance. The coefficients in the model were then systematically calibrated to fit trip length distribution observed from the available travel survey. The impedance related utility coefficients in the model are tabulated below:

Table 9: Impedance Related Utility Coefficients in Destination Choice

Person Type	Activity	Time	Dist	Dist^2	Dist^3	ln(Dist +1)
Worker_GCP	Work	-0.04	0.05	0	0	-0.85
Worker_GCP	Other	-0.21	0.04	0	0	-0.75
Worker_GCP	Stop	-1.4	0	0	0	0
Worker_MCT	Work	-0.04	0.05	0	0	-0.85
Worker_MCT	Other	-0.21	0.04	0	0	-0.75
Worker_MCT	Stop	-1.4	0	0	0	0
Worker_MIL	Work	-0.04	0.05	0	0	-0.85
Worker_MIL	Other	-0.21	0.04	0	0	-0.75
Worker_MIL	Stop	-1.4	0	0	0	0
Student_Elem	School	-0.22	-0.07	0	0	-0.9
Student_Elem	Other	-0.21	0.04	0	0	-0.75
Student_Elem	Stop	-1.5	-0.5	-0.03	0	-0.25

Person Type	Activity	Time	Dist	Dist^2	Dist^3	ln(Dist +1)
Student_High	School	-0.4	-0.15	0	0	0
Student_High	Other	-0.21	0.04	0	0	-0.75
Student_High	Stop	-1.5	-0.5	-0.03	0	-0.25
Student_Univ	School	-0.1	-0.05	0	0	-1.1
Student_Univ	Other	-0.21	0.04	0	0	-0.75
Student_Univ	Stop	-1.5	-0.5	-0.03	0	-0.25
NonWorker	Other	-0.21	0.04	0	0	-0.75
Senior	Other	-0.21	0.04	0	0	-0.75

Destination Choice Model Validation

The destination choice models were calibrated for the trip lengths observed in the available household travel survey. A summary of the trip length validation for the modeled primary and secondary trip purposes is given below.

Table 10: Average Trip Length Validation

	Trip Length (miles)	
Purpose	**HH Survey**	**Model**
Work	8.35	8.85
School (K8)	3.31	3.58
High School	4.26	4.47
Post-Secondary	8.61	8.93
Other/non-work	4.74	5.19
Stops on Work Tour	5.15	5.49
Stops on School Tour	4.17	4.47

Figure 11: Work/School Trip Length Validation

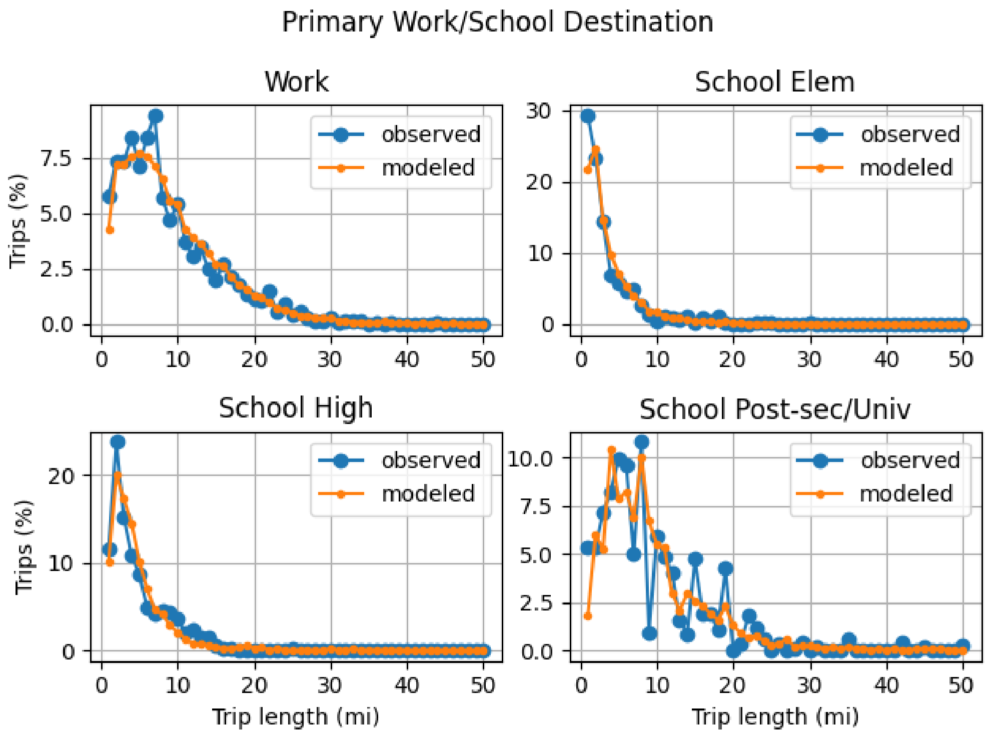
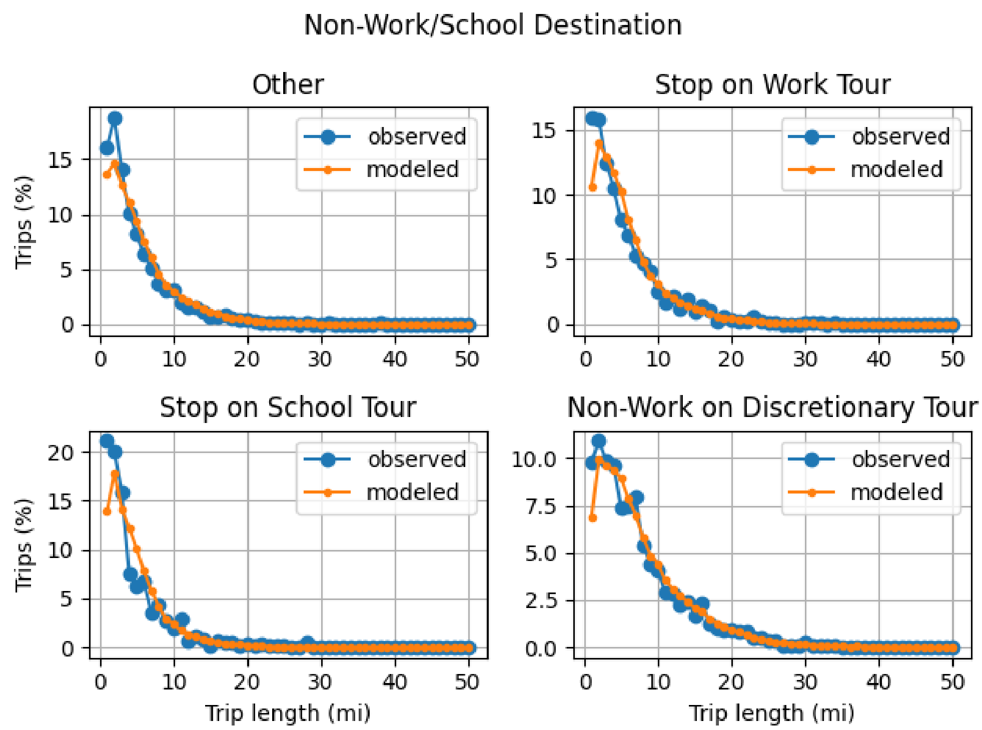


Figure 12: Discretionary and Other Trip Length Validation



Tour Based Mode Choice

Mode choice: The mode choice functional form is the commonly used logit model. Mode choice can be specified at the person type level as well as the destination activity level. In the PPACG model, it is specified at the person type and destination activity level. The freedom of choice restrictions within trip chains where a traveler may switch between travel modes from one leg of the tour to another is accounted for by defining modes as exchangeable or non-exchangeable. Thereafter, the tour-based model calculates a logit choice model. In the tour-based framework, mode choice is computed either based on primary activity when using rubber-banding or applied to each trip leg along the tour when rubber-banding is turned off. Trip chains or tours with work or school were calculated using rubber-banding and other trip chains were calculated using the sequential mode choice model. The coefficients for the mode choice model were adopted from the FHWA-TMIP[4] guidelines. The constants were then adjusted to align the mode choice results with the available travel survey data.

Six travel modes were considered in the PPACG model. The coefficients and calibrated constants for these are summarized in the tables below.

Table 11: Mode Choice Coefficients

Purpose	Time (Min)	Cost ($)
Work	-0.018	-0.184
Non-work	-0.024	-0.25

Table 12: Calibrated Alternative Specific Constants

Person Type	Purpose	Auto (sov)	Auto (hov)	Transit	Bike	Walk	SchBus
Worker_GCP	Work	0	-3.59	-4.03	-4.04	-3.03	N/A
	Other	0	-1.9	-2.93	-4.04	-2.58	N/A
Worker_MCT	Work	0	-3.59	-5.93	-4.04	-3.03	N/A
	Other	0	-1.9	-4.93	-4.04	-2.58	N/A
Worker_MIL	Work	0	-3.59	-5.93	-4.04	-3.03	N/A
	Other	0	-1.9	-4.93	-4.04	-2.58	N/A
Student_Elem	School	N/A	0	-999	-4.16	-1.76	-0.932
	Other	N/A	0	-999	-4.16	-1.76	N/A

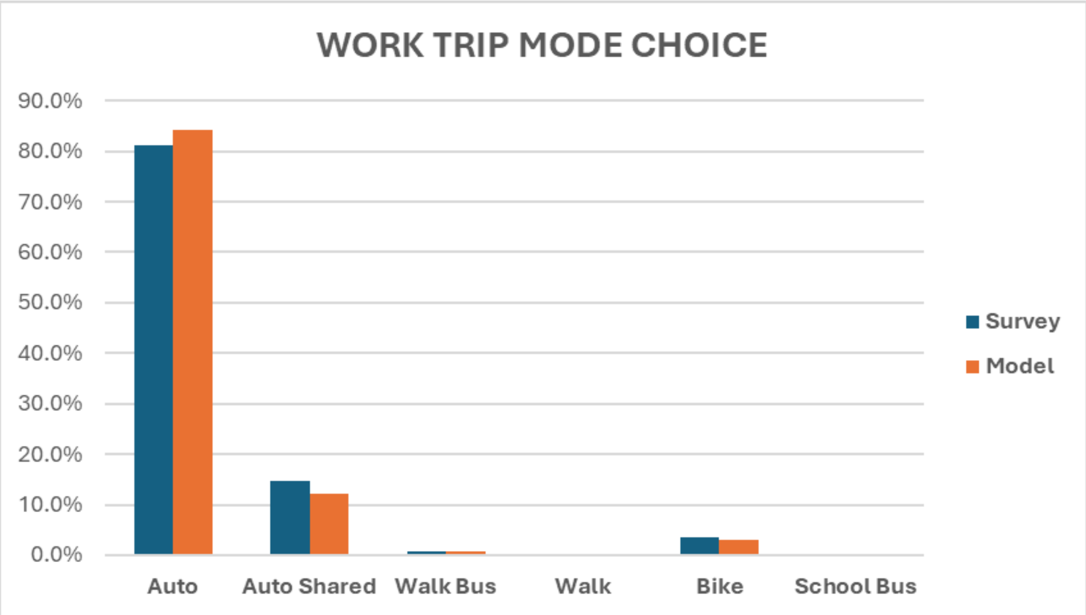
[4] https://www.fhwa.dot.gov/planning/tmip/publications/other_reports/validation_and_reasonableness_2010/fhwahep10042.pdf

Student_High	School	-0.402	0	-4.42	-3.09	-1.46	-0.622
	Other	-0.402	0	-4.42	-3.09	-1.46	-0.622
Student_Univ	School	1.67	0	-1.11	-1.72	-1.45	N/A
	Other	1.67	0	-1.11	-1.72	-1.45	N/A
Non_worker	Other	0	-1.9	-3.43	-999	-3.58	N/A
Senior	Other	0	-1.3	-3.91	-999	-2.73	N/A

Mode Choice Model Validation

The mode choice model was validated against the available expanded survey data. These summaries are presented below.

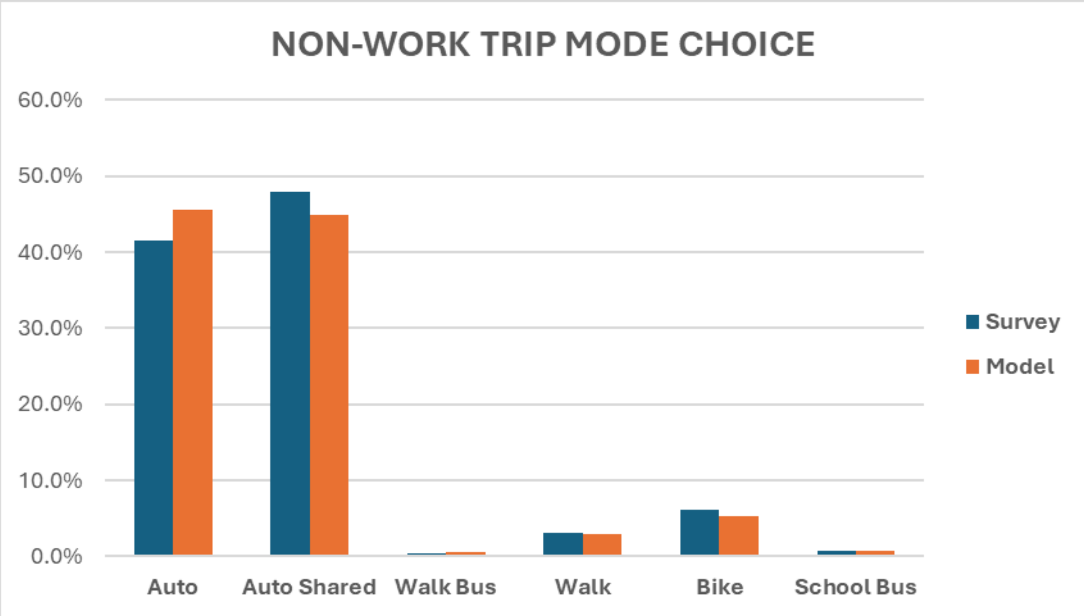
Figure 13: Work Mode Choice Validation



WORK

Observed Mode	Observed Trips	Estimated Mode	Estimated Trips	Estimated Scaled Mode	Estimated Scaled Trips	Observed % Mode	Observed % Percent	Estimated % Mode	Estimated % Percent
Auto	181,419	Auto	200,962	Auto	200,962	Auto	81.2%	Auto	84.2%
Auto Shared	32,606	Auto Shared	28,857	Auto Shared	28,857	Auto Shared	14.6%	Auto Shared	12.1%
Walk Bus	1,574	Walk Bus	1,499	Walk Bus	1,499	Walk Bus	0.7%	Walk Bus	0.6%
Walk	140	Walk	217	Walk	217	Walk	0.1%	Walk	0.1%
Bike	7,684	Bike	7,213	Bike	7,213	Bike	3.4%	Bike	3.0%
School Bus	-	School Bus	-	School Bus	-	School Bus	0.0%	School Bus	0.0%
Total	223,424	Total	238,748	Total	238,748	Total	100%	Total	100%

Figure 14: Non-work Mode Choice Validation



NON WORK

Observed		Estimated		Estimated Scaled		Observed %		Estimated %	
Mode	Trips	Mode	Trips	Mode	Trips	Mode	Percent	Mode	Percent
Auto	786,045	Auto	1,128,195	Auto	1,128,195	Auto	41.5%	Auto	45.6%
Auto Shared	908,111	Auto Shared	1,109,467	Auto Shared	1,109,467	Auto Shared	47.9%	Auto Shared	44.9%
Walk Bus	9,121	Walk Bus	12,699	Walk Bus	12,699	Walk Bus	0.5%	Walk Bus	0.5%
Walk	59,630	Walk	73,503	Walk	73,503	Walk	3.1%	Walk	3.0%
Bike	115,794	Bike	131,939	Bike	131,939	Bike	6.1%	Bike	5.3%
School Bus	15,377	School Bus	16,677	School Bus	16,677	School Bus	0.8%	School Bus	0.7%
Total	1,894,078	Total	2,472,480	Total	2,472,480	Total	100%	Total	100%

3.3 Time of Day Calculation

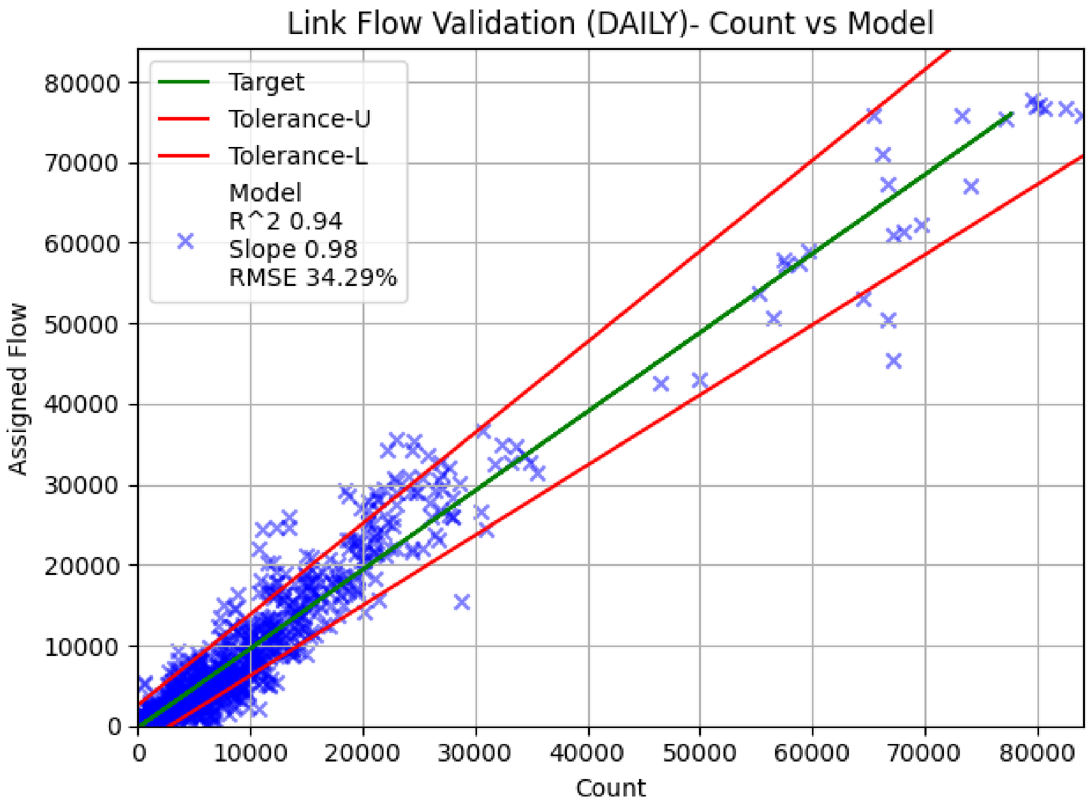
Time of day calculation: The time-of-day distribution of trips in the aggregate tour-based structure is based on direct application of empirical departure time profiles of each activity pair by person type. These departure time profiles were extracted from the existing travel survey. Since the travel survey was from 2010, it did not account for the post-covid changes seen in the time-of-day distribution of travel. An updated travel survey or other alternative information would allow a more accurate modeling of time-of-day travel patterns. A more detailed discussion around this issue presented in the later section on simulation-based dynamic assignment (SBA).

3.4 Network Assignment

Network assignment: Only motorized modes are assigned to obtained network flows in the PPACG model. Traffic assignment is performed for five macro time periods: Early, AM, MD, PM and Evening. Network flows from each of the time periods are aggregated into daily traffic flows. Headway based assignment is used for transit assignment. Demand is calculated at the same resolution as the traffic assignment and assigned at once with AM, PM periods using an average peak headway and the Early, MD and Evening periods using an average off-peak headway.

Traffic Assignment Validation

The traffic assignment was validated using the AADT model flows and average traffic counts available. An RMSE of 35%, R^2 of 0.94 and slope of 0.98 was achieved for the overall network. The statistics for each major link classification are presented in the table below.



FACTYPE	FACNAME	NUMOBS	SLOPE	%RMSE
1	Interstates	32	0.939	8.10%
2	Expressway	49	1.016	14.80%
3	Principal Arterials	375	1.24	23.80%
4	Minor Arterials	285	0.815	37.10%
5	Collector	312	0.772	59.90%
6	Residential	0	0	N/A
7	Ramp	93	1.007	28.30%

Transit Assignment Validation

The transit assignment was validated against overall line boardings. The mode choice coefficients were adjusted to produce overall line boardings that reflected the overall observed line boardings. The transit system has seen a steady decline in ridership from 2019 to 2021. As a result, an average of total line boardings over this period was used to validate the transit line boardings produced by the model. The transit route choice was not specifically calibrated due to the overall sparsity of ridership and relatively older travel survey. The boardings by route are summarized in the table below.

ROUTE_ID	ROUTE_CODE	ROUTE_NAME	MODEL_BOARDINGS	OBS_BOARDINGS
1	MMT_3416	Hillside - Hancock Plaza	555	564
10	MMT_3417	Hwy 115 - PPSC	218	425
11	MMT_3418	World Arena - PPSC	459	670
12	MMT_3419	Palmer Park Blvd	139	73
14	MMT_3420	Chestnut St - G.O.G. Rd	99	179
15	MMT_3421	FOUNTAIN BLVD -E CHEYENNE MTN BLVD	44	52
16	MMT_3422	Brookside - Uintah Gardens	112	85
17	MMT_3423	19TH STREET/FILLMORE	79	68
18	MMT_3424	Union Blvd	105	20
19	MMT_3425	WEBER - EAGLE ROCK	131	263
2	MMT_3426	CENTENNIAL BLVD - G.O.G. Rd	76	119
22	MMT_3427	SOUTHBOROUGH VIA MURRAY BLVD	322	218
23	MMT_3428	Barnes Rd. - Tutt Blvd	421	258
25	MMT_3430	N. ACADEMY BLVD - VOYAGER	1,556	802
27	MMT_3431	S. ACADEMY BLVD - PPSC	477	458
3	MMT_3432	COLORADO AVE - MANITOU	341	534
32	MMT_3433	SECURITY/WIDEFIELD	189	88
33	MMT_3434	INCLINE/COG SHUTTLE	32	400
34	MMT_3435	GOG/AUSTIN BLUFFS PKWY	158	123
35	MMT_3436	LAS VEGAS ST/ PPSC	28	47
38	MMT_3439	UNION/ CHILDRENS HOSPITAL	64	7
39	MMT_3440	CORPORATE DR - VOYAGER PKWY	123	54
4	MMT_3441	S. 8th STREET - BROADMOOR	155	202

ROUTE_ID	ROUTE_CODE	ROUTE_NAME	MODEL_BOARDINGS	OBS_BOARDINGS
40	MMT_3442	VOYAGER - RAMPART PPSC	51	32
5	MMT_3443	Boulder - Citadel	744	923
6	MMT_3444	FILLMORE - Citadel	137	131
7	MMT_3445	Pikes Peak Ave. - Citadel	235	355
8	MMT_3446	Cache La Poudre - Citadel	32	67
9	MMT_3447	NEVADA - UCCS	237	344
ZEB	MMT_3448	ZEB Downtown Shuttle	438	65
TOTAL			**7,757**	**7,626**

3.5 Simulation Based Dynamic Traffic Assignment (SBA)

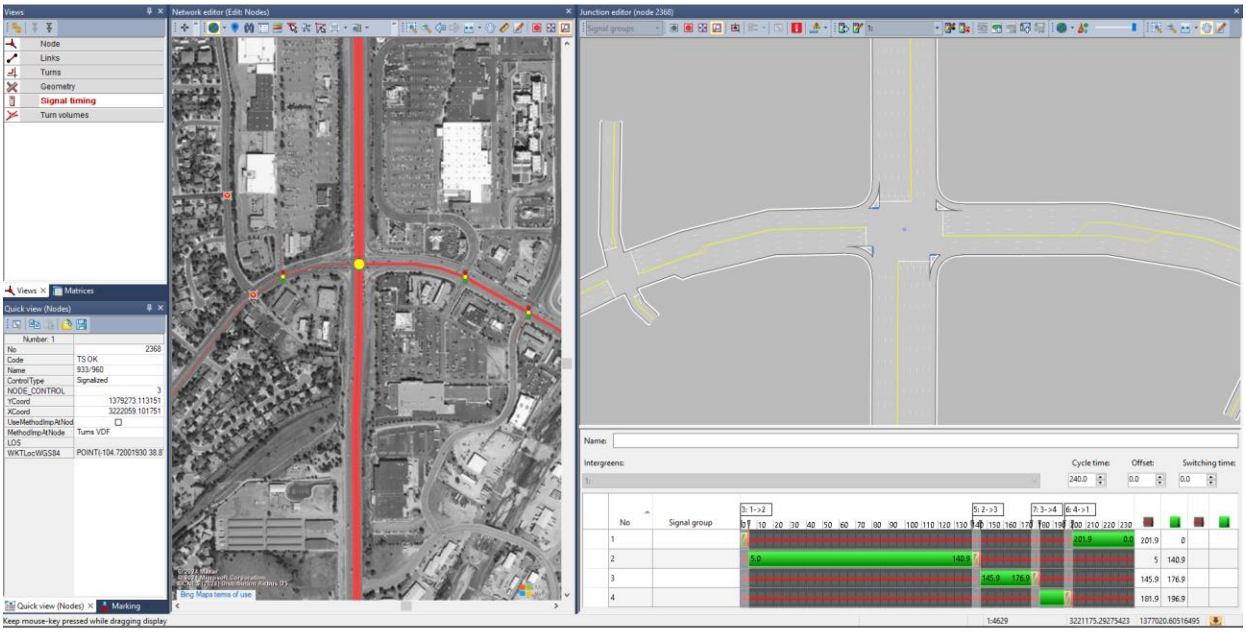
One of the key uses of the PPACG model is evaluation of air quality conformity and GHG analysis. While the actual GHG analysis is performed using US EPA's MOVES software, the link speed and volume inputs required in the analysis are generated using the PPACG model. The link speed and volume inputs are required at hourly intervals. As a result, simulation based dynamic traffic assignment (SBA) integrated into Visum was used as a post-process to obtain network link speeds at hourly intervals with relevant accounting of intersection level delays. SBA involves two components. Network preparation and hourly demand generation. These two items are discussed next.

Network Preparation for SBA

The Visum modeling platform used to implement the PPACG model natively stores multi-resolution network data. Here, the detailed lane geometry and intersection control (signal timings) can be specified in addition to the typical link-node data used in static traffic assignments. The appropriate level of network detail is used or ignored based on the type of traffic assignment selected by the user. The multi-resolution network storage concept is illustrated in the figure below.

The entire PPACG model network was carefully reviewed for the correct number of roadway lanes, posted speeds and intersection control type. Aerial imagery was used to code detailed intersection geometry with appropriate turn bays and lane grouping at all intersections in the model network. The network base year for the model is 2020. There are ~1500 controlled intersections in the model network. Out of these, ~700 intersections are signalized. Signal phasing plans for all these intersections were developed based on the lane grouping at approach legs. The green time and splits were calculated based on turn flows obtained from the static traffic assignment. Coding signal timings in this manner allows an overall consistent delay representation in the network. It also allows the methodology to be extended to all forecast networks.

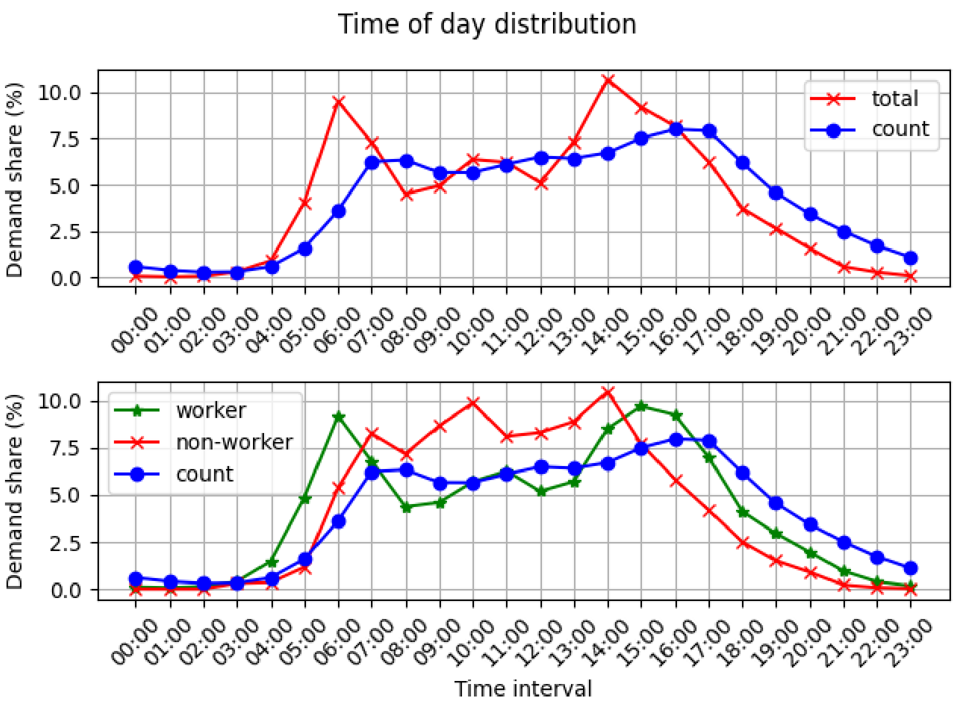
Figure 15: Integrated Multi-resolution Network Representation in Visum



Demand Preparation for SBA

The tour-based model allows flexibility in specifying outputs for any time of day. Ordinarily, the hourly demand for the SBA would be derived by specifying an hourly demand output setting in the tour-based model calculation setup.

Figure 16: Pre-COVID19 Demand Profile vs Post-COVID19 Count Profile



However, the changes in time use patterns seen after COVID19 and time of day factors derived from relatively older travel survey data (2010) made the direct use of time-of-day factors applied to activity pairs unviable. This was clearly seen by plotting the 24-hour demand profiles from the travel survey against the more updated 24-hour count data. The post-COVID19 time-of-day count profiles exhibit a much greater spreading of the traffic flows as opposed to the shaper AM and PM peak flows exhibited by the demand profiles extracted from the pre-COVID19 2010 travel survey. This change in travel pattern presented a major challenge in the development of 24-hour demand profiles and model calibration in general. Since count data was the most updated source of time-of-day distribution of traffic patterns, dynamic matrix estimation was used to re-profile the demand calculated for macro time periods (EA, AM, MD, EV) into hourly trip tables for use in SBA. The link flow validation for hourly flows is tabulated and plotted below. The early morning and late evening time periods have a greater %RMSE due to the overall lower volumes but are within the NCHRP allowable tolerance for hourly flows.

Table 13: SBA Hourly Link Flow Validation

Time Interval	R2	Slope	%RMSE
00:00	0.93	0.86	63.64%
01:00	0.89	0.85	75.01%
02:00	0.87	0.82	74.52%
03:00	0.8	0.82	81.80%
04:00	0.66	0.59	99.22%
05:00	0.76	0.78	72.51%
06:00	0.89	0.91	42.61%
07:00	0.93	0.98	32.52%
08:00	0.95	0.98	31.37%
09:00	0.96	0.98	30.18%
10:00	0.96	0.99	28.19%
11:00	0.96	1.01	28.21%
12:00	0.96	1.01	28.15%
13:00	0.96	1.01	27.65%
14:00	0.96	1.01	27.75%
15:00	0.95	1.02	29.80%
16:00	0.95	1.02	29.45%
17:00	0.95	1.01	29.61%
18:00	0.95	0.99	32.55%
19:00	0.94	0.98	42.88%
20:00	0.93	0.99	47.45%
21:00	0.94	0.96	47.56%
22:00	0.94	0.93	51.48%
23:00	0.93	0.90	58.48%
DAILY	**0.96**	**1.00**	**27.78%**

Figure 17: AM Period Hourly Link Flow Validation

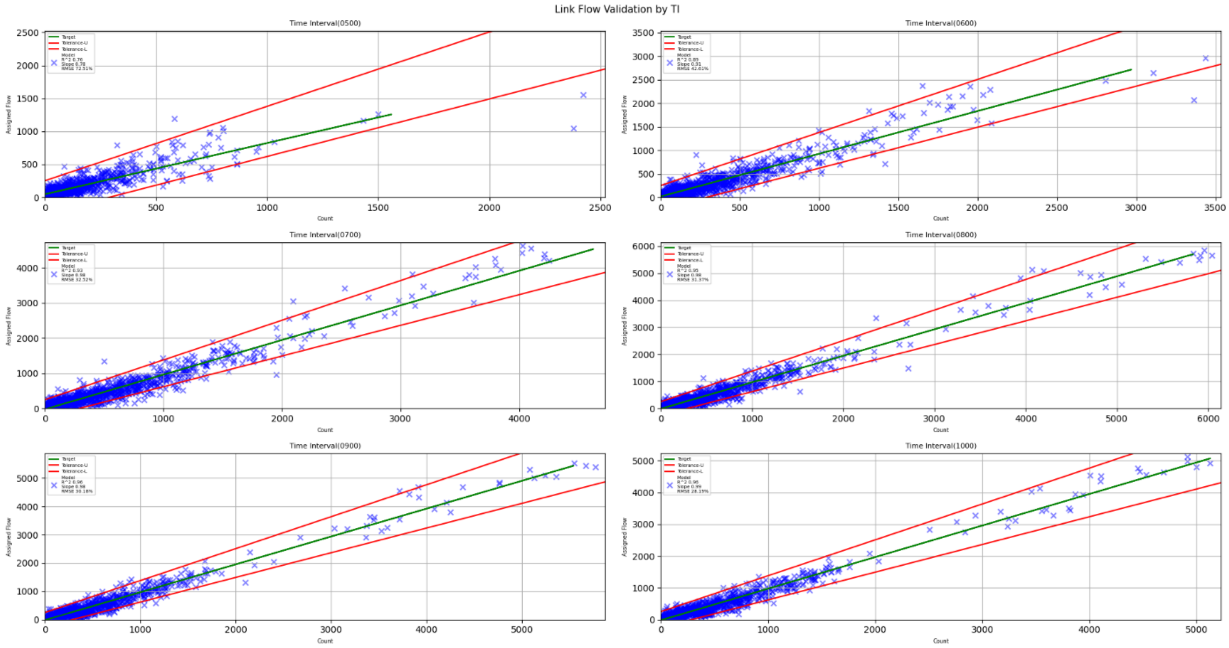
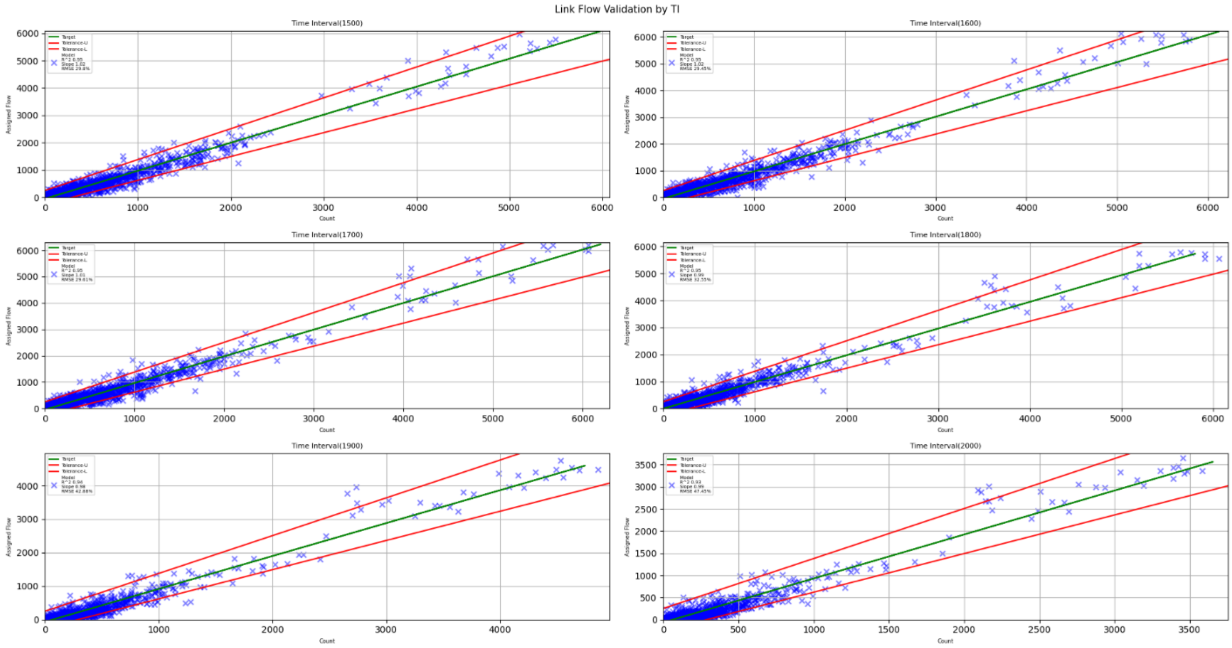
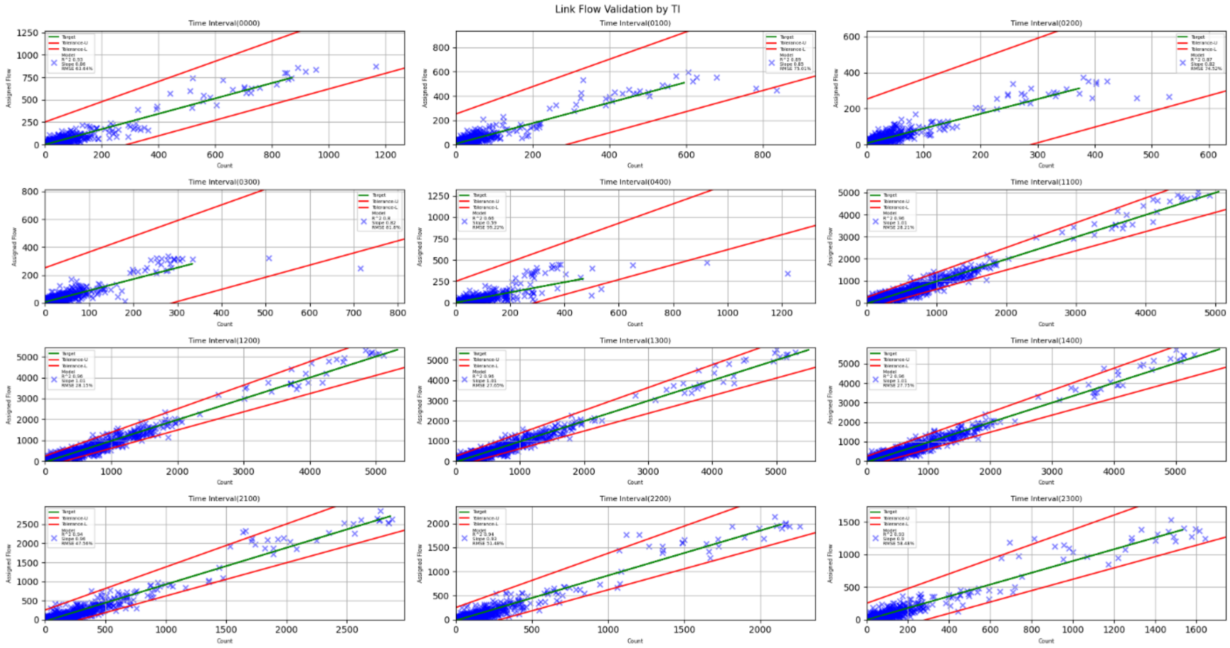


Figure 18: PM Period Link Flow Validation



the mind of movement

Figure 19: OP Link Flow Validation

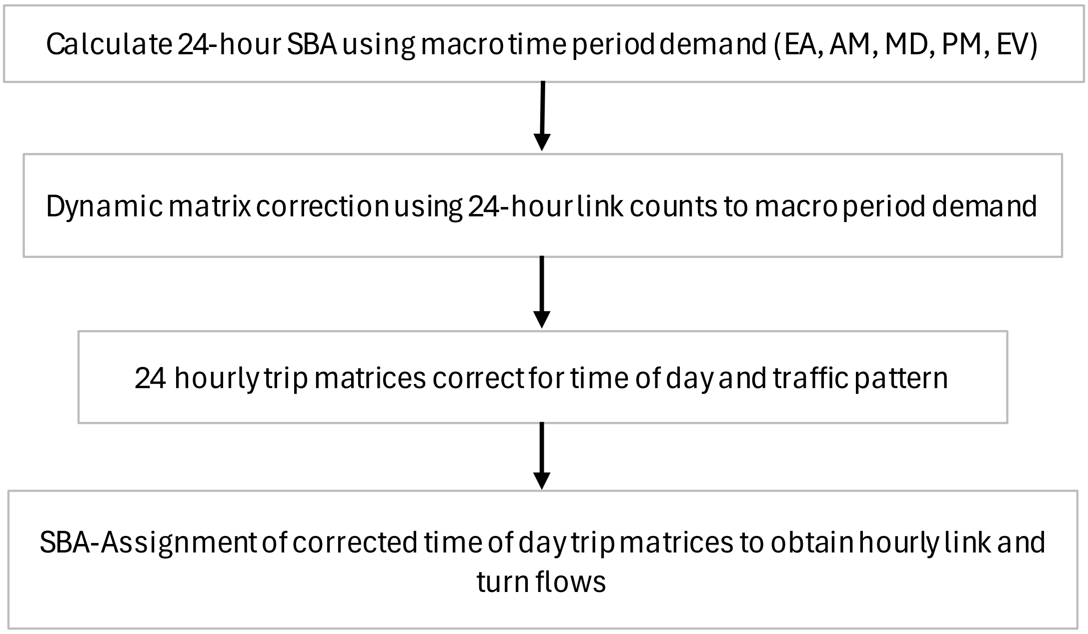


The dynamic matrix estimation method implemented in Visum is based on a least squares minimization formulation. Here, the sum of squared error between network counts and network flows arising from traffic assignment is minimized using a gradient method.

Conceptually, the dynamic matrix estimation method is like the static variant but adds a time dimension to the problem formulation. In the dynamic variant, the rows of the flow matrix no longer correspond to the count locations, but to the cross product of count locations and analysis time intervals; the columns of the flow matrix no longer correspond to the quantity of the OD pairs, but to the entire demand time series. An entry in the flow matrix corresponds to the proportion of the demand of an OD pair during a demand time interval that passes a count location during an analysis time interval.

Since the original seed trip matrices and total number of trips are used in the overall solution formulation, the method also minimizes the distortion of the original matrix structure and preserves the number of trips in the seed matrices. This property also allows the use of adjusted base year hourly trip matrices to generate hourly link flows when assigned using SBA and as a reasonable basis for generating hourly trip matrices for the forecast years. As noted earlier, re-calibration of the tour-based model based on more steady traffic patterns and an updated travel survey would eliminate the necessity of using the dynamic matrix estimation post-process to obtain hourly trip matrices aligned with the observed time of day traffic patterns.

Figure 20: Steps to Obtain Hourly Link Flows - Base Condition



The methodology used in developing hourly trip assignment matrices for the forecast conditions is illustrated in the flowchart below.

4. Remarks

One of the challenges in the model calibration process was that the available travel survey was from 2010, and the latest data used in the model validation was over multiple years starting 2019 and ending 2022 with the COVID19 pandemic and its effects occurring during this period. As a general strategy, the model was thus not overfit to observations. It would be of benefit to take up a more thorough calibration and validation exercise when new travel survey data with a more stable set of observations from new travel trends is available.

MEMORANDUM

TO: Ms. Marissa Gaughan, CDOT Multimodal Planning Branch Manager

FROM: Dale Tischmak and Jake Fritz

DATE: January 21, 2022

SUBJECT: DRAFT MOVES3 Greenhouse Gas Modeling Methodology (117429-32)

Introduction

This document summarizes the methodology used to calculate greenhouse gas (GHG) emissions for the CDOT Statewide Travel Demand Model (TDM). Previous GHG modeling to support CDOT was conducted by APCD. This methodology replicates APCD's modeling process as best as possible.

For more information about GHG modeling using MOVES, see the *Using MOVES for Estimating State and Local Inventories of On-road Greenhouse Gas Emissions and Energy Consumption* guidance document linked to in the references (i.e., EPA 2016).

The process begins with generating emission rates using the EPA's Motor Vehicle Emission Simulator version 3.0.1 (MOVES3). The emission rates are multiplied by the vehicle miles traveled from the TDM. The result is an emissions inventory. A series of data engineering steps are required to prepare the rates and VMT into desirable and compatible formats.

MOVES3 Run Specifications

The run specification (RunSpec) parameters outlined below were used to calculate GHG emission rates with MOVES. They are consistent with APCD's process to calculate GHG emissions.

The four modeled years 2025, 2030, 2040, and 2050 used the same run specifications except for where specified (e.g., the year being modeled). Each of the four modeled years has six related run specifications to separate the emission rates by vehicle type, as described in the On-road Vehicles section.

Scale

The "Scale" parameters define the model type (on-road or non-road), domain/scale, and calculation type.

Model Type

On-road was the model type selected. This estimates emissions from motorcycles, cars, buses, and trucks that operate on roads.

Non-road/off-network emissions were not included. These emissions are from equipment used in applications such as recreation, construction, lawn and garden, agriculture, mining, etc. and are outside of the scope of this analysis.

Domain/Scale

MOVES allows users to analyze mobile emissions at various scales: National, County, and Project. While the County scale is necessary to meet statutory and regulatory requirements for SIPs and transportation conformity, either the County or National scale can be used for GHG inventories. EPA recommends using the

County scale for GHG analysis. The County scale allows the user to enter county-specific data through the County Data Manager. Providing local data significantly improves the precision of the modeling results (EPA 2016).

The County scale was used.

Calculation Type

MOVES has two calculation types - Inventory (total emissions in units of mass) or Emissions Rates (emissions per unit of distance for running emissions or per vehicle for starts and hotelling emissions) in a look-up table format must be post-processed to produce an inventory. Either may be used to develop emissions estimates for GHGs (EPA 2016).

The Emission Rates calculation type was used.

Time Span

The "Time Span" parameters define the years, months, days, and hours that emissions are calculated.

When Emission Rates is chosen, users may choose to approach the selection of options in the Time Spans Panel differently than when running MOVES in Inventory mode. For example, when modeling running emission rates, instead of entering a diurnal temperature profile for 24 hours, users can enter a range of 24 temperatures in increments that represent the temperatures over a period of time. By selecting more than one month and using a different set of incremental temperatures for each month, users could create a table of running emission rates by all the possible temperatures over an entire season or year (EPA 2016).

When using Emission Rates instead of Inventory, the time aggregation level is automatically set to Hour and no other selections are available. Pre-aggregating time does not make sense when using Emission Rates and would produce emission rates that are not meaningful (EPA 2016). However, the year, month, and day must still be specified and will affect the emission rates calculated.

The time span parameters specified below were also used because the TDM outputs represent an annual average weekday.

Years

The County scale in MOVES allows only a single calendar year in a RunSpec. Users who want to model multiple calendar years using the County scale will need to create multiple RunSpecs, with local data specific to each calendar year, and run MOVES multiple times (EPA 2016).

The years used were 2025, 2030, 2040, and 2050. Emission rates for each of these years were calculated separately. This accounts for information such as a changing age distribution of vehicles and their corresponding fuel efficiency.

Months

MOVES allows users to calculate emissions for any or all months of the year. If the user has selected the Emission Rates option, the Month can be used to input groups of temperatures as a shortcut for generating rate tables for use in creating inventories for large geographic areas (EPA 2016).

The months used were January and July to match the process described by APCD. These represent winter and summer months and generally the extremes in annual weather conditions. This accounts for changes in fuel efficiency between warm and cold temperatures throughout the year. The arithmetic averages of emission rates from January and July were used for the final emissions inventory.

Days

Weekdays and weekend days can be modeled separately in MOVES. MOVES provides the option of supplying different speed and VMT information for weekdays and weekend days to allow the calculation of separate emissions estimates by type of day (EPA 2016).

The days used were weekdays to match the TDM output data. These represented the emission rates for an average weekday. The results were escalated later to approximate a full year.

Hours

The hours used were all 24 hours of the day (i.e., clock hours of 1 AM, 2 AM, 3 AM, etc.). These represent the emission rates for individual hours of a day. This accounts for changes in fuel efficiency between warm and cold temperatures throughout the day.

Geographic Bounds

The "Geographic Bounds" parameter defines the county(s) used. For a county-scale run, only one county can be selected per RunSpec. The county used was Adams County, Colorado. The county defines input parameters such as the meteorology data used to estimate emission rates.

On-road Vehicles

MOVES describes vehicles by a combination of vehicle characteristics (e.g., passenger car, passenger truck, light commercial truck, etc.) and the fuel that the vehicle is capable of using (gasoline, diesel, etc.). The [Panel] is used to specify the vehicle types included in the MOVES run (EPA 2016).

The "On-road Vehicles" parameter defines the source types (i.e., vehicle types) and their fuels (gasoline, diesel, electricity, etc.). All combinations of vehicle types and fuels available in MOVES3 were used to calculate the emission rates. APCD's process, which was being followed, assigns TDM mileage based on a modified HPMS category. To calculate aggregate emission rates for each HPMS category (i.e., merging all of the relevant source types and fuel types), each of the six HPMS categories used a separate RunSpec. It is important to note that APCD's modified HPMS category does not match the MOVES HPMS types for source types 21, 31, and 32. When this methodology document refers to HPMS categories, it is generally referring to APCD's HPMS categories. The figure below illustrates the HPMS categories.

	A	B	C	D	E
1	sourceTyp	sourceTypeName	HPMSVtypeID	HPMSVtypeName	**HPMS from APCD**
2	11	Motorcycle	10	Motorcycles	**10**
3	21	Passenger Car	25	Light Duty Vehicles	**20**
4	31	Passenger Truck	25	Light Duty Vehicles	**30**
5	32	Light Commercial Truck	25	Light Duty Vehicles	**30**
6	41	Other Buses	40	Buses	**40**
7	42	Transit Bus	40	Buses	**40**
8	43	School Bus	40	Buses	**40**
9	51	Refuse Truck	50	Single Unit Trucks	**50**
10	52	Single Unit Short-haul Truck	50	Single Unit Trucks	**50**
11	53	Single Unit Long-haul Truck	50	Single Unit Trucks	**50**
12	54	Motor Home	50	Single Unit Trucks	**50**
13	61	Combination Short-haul Truck	60	Combination Trucks	**60**
14	62	Combination Long-haul Truck	60	Combination Trucks	**60**

Road Type

The Road Type Panel is used to define the types of roads that are included in the run. MOVES defines five different road types as shown in Table 3-1. Generally, all road types should be selected including Off-Network. Selection of road types in the Road Type Panel determines the road types that will be included in the MOVES run results (EPA 2016).

Table 3-1: MOVES Road Types

Roadtypeid	Road type	Description
1	Off-Network	Locations where the predominant activity is vehicle starts, parking and idling (parking lots, truck stops, rest areas, freight or bus terminals)
2	Rural Restricted Access	Rural highways that can be accessed only by an on-ramp
3	Rural Unrestricted Access	All other rural roads (arterials, connectors, and local streets)
4	Urban Restricted Access	Urban highways that can be accessed only by an on-ramp
5	Urban Unrestricted Access	All other urban roads (arterials, connectors, and local streets)

All road types available in MOVES3 were used.

Pollutants and Processes

The Pollutants and Processes Panel allows users to select from various pollutants, types of energy consumption, and associated processes of interest. In MOVES, a pollutant refers to particular types of pollutants or precursors of a pollutant but also includes energy consumption choices. Processes refer to the mechanism by which emissions are released, such as running exhaust or start exhaust. Users should select all relevant processes associated with a particular pollutant to account for all emissions of that pollutant. Generally, for this project, that includes running emissions.

The CO2 Equivalent pollutant is the sum of the global warming potential of other greenhouse gases expressed as a unit of CO2 (EPA 2016) and CO2 Equivalents (CO2e) is the pollutant of interest for these GHG calculations. MOVES requires several other prerequisite pollutants for CO2e; however, only the emission rates for CO2e were needed for this project.

General Output

The "General Output" parameters define the output database, units, and activity.

Output Database

Results from the six related HPMS RunSpecs for a single emissions year can be stored in a single output database for convenience. The RunSpecs must have the same units and aggregation (EPA 2016). A different output database is needed for each year of emission rate calculations. A consistent and informative naming convention for all output databases is very valuable.

One output database was used for each year modeled (i.e., 2025, 2030, 2040, and 2050). Each output database contained results for six RunSpecs, where each RunSpec represented a different APCD HPMS type. The naming convention FHU used was as follows:

[firm]_[pollutant]_[year][region]_[description]_[database type]

[firm] = The company or agency performing the analysis.

[pollutant] = The pollutant(s) of interest.

[year] = The year that emission rates were generated for.

[region] = The geographic area that emission rates were generated for.

[description] = An abbreviated description of relevant notes for the RunSpec.

[database type] = Whether the database was an input or output database.

For example, the database "fhu_ghg_2025sw_wev_in" represented an input database for greenhouse gases, the year 2025, the Statewide Transportation Plan, with electric vehicles, and was performed by FHU.

Units

Users are free to choose any of the mass unit selection options but should generally choose a unit whose magnitude is appropriate for the parameters of the RunSpec (EPA 2016).

The units used for models were grams for mass, joules for energy, and miles for distance.

Activity

MOVES allows the user to select multiple activity output options (e.g., distance traveled, population, etc.). For Emission Rate calculations, distance and population are reported automatically, but the values in the output are intermediate steps in the rate calculation and do not represent the true activity (EPA 2016).

When calculating emission rates (as opposed to emission inventories), MOVES selects the activities hoteling hours, population, and starts without the option of changing them.

Output Emissions Detail

This panel allows the user to select the amount of detail provided in the output database. Certain selections on this panel are made by the MOVES software and cannot be changed, based on selections made on earlier panels. The more boxes checked on this panel, the more detail and segregation provided in the MOVES output database. More detail generally is not helpful for this process so no optional selections should be checked on this panel. For example, if Source Use Type were selected on this panel, emission rates for each of the MOVES vehicle Source Use Type categories would be reported in the output database, which would defeat the purpose of performing MOVES calculations based on consolidated HPMS category.

No optional aggregation selections were made on this panel. Source type detail was captured via the six HPMS RunSpecs for each year modeled, as described in the On-road Vehicles section. Since multiple source types were used for HPMS 30, 40, 50, and 60, emission rates were aggregated for into HPMS categories. That is, emission rates for MOVES source types 31 and 32 were aggregated into the HPMS 30 RunSpec, etc.

Input Database/County Data Manager

After completing the RunSpec, the next step is to supply MOVES with data to create an input database that is the basis for the emission rate calculations. When using the County scale, the County Data Manager (CDM) is used to create an input database and populate it with local data. Modelers can either rely on MOVES default information or local data that the user inputs, as is appropriate for the goals of the MOVES modeling. The data contained in the MOVES default database are typically not the most current or best available for any specific county. Therefore, with the exception of fuels, EPA recommends using local data for MOVES for GHG analyses when available to improve the accuracy of GHG emissions estimates. However, the MOVES default data (county level) may be the only or best source of that data readily available. Also consider that data consistency may be more important than data perfection for some GHG analyses. At a minimum, EPA strongly encourages the use of local VMT and vehicle population data. EPA believes these inputs have the greatest impact on the quality of results. However, if local data are not available, MOVES default data may be useful for some inputs without affecting the quality of the results (EPA 2016).

In Emissions Rates mode, a full gamut of input data must be provided, described below, for MOVES to run. Some of these inputs actually do not affect the ultimate emission rates (they would affect inventory mode output) but reasonable inputs in the CDM should be used for general data integrity. As a general rule, users should input accurate activity for the scenario being modeled regardless of whether MOVES is being used in Inventory or Emissions Rates mode (EPA 2016).

The "Create Input Database" parameters define the region-specific inputs such as distributions of road types, vehicle age distributions, and meteorology data. The parameters specified in RunSpecs pre-populate the input database with default data for some of the parameters. However, region-specific data should be used when available and not all parameters have default data.

One comprehensive input database was created for each year modeled. Each of the six HPMS RunSpecs for that year used that single input database and were saved to a single output database. The input data were entered with the MOVES County Data Manager window, as specified below.

Age Distribution

A typical vehicle fleet includes a mix of vehicles of different ages, referred to as Age Distribution in MOVES. MOVES covers a 31 year range of vehicle ages, with vehicles 30 years and older grouped together. MOVES allows the user to specify the fraction of vehicles in each of 30 vehicle ages for each of the 13 source types in the model. For estimating on-road GHG emissions, EPA recommends and encourages states to develop age distributions that are applicable to the area being analyzed (EPA 2016).

APCD has developed a vehicle age distribution, and it was used for each year modeled.

Average Speed Distribution

This input is more important for Inventory than Emission Rates. Vehicle power, speed, and acceleration have a significant effect on vehicle emissions, including GHG emissions. MOVES models those emission effects by assigning activity to specific drive cycles. The Average Speed Distribution Importer in MOVES calls for a speed distribution in VHT in 16 speed bins, by each road type, source type, and hour of the day included in the analysis. EPA urges users to develop the most detailed local speed information that is reasonable to obtain. However, EPA acknowledges that average speed distribution information may not be available at the level of detail that MOVES needs (EPA 2016).

The Emission Rates option in MOVES will produce a table of emission rates by road type for each speed bin. Total running emissions are then quantified outside of MOVES by multiplying the emission rates by the VMT for each source type in each vehicle speed category. Users should supply an appropriate speed distribution to produce the necessary emission rates (EPA 2016).

APCD uses MOVES default data for all years in emission rate mode for their GHG models. This was used for each year modeled. Since emission rates were calculated (as opposed to emission inventories), the average speed distribution used in MOVES will not change the emission rates calculated. The speeds are accounted for in the TDM data.

Fuel

Entering this input data into MOVES involves four tables – called FuelFormulation, FuelSupply, FuelUsageFraction, and AVFT (alternative vehicle fuels and technology) – that interact to define the fuels used in the area being modeled.

- The FuelSupply Table identifies the fuel formulations used in a region (the regionCounty Table defines which specific counties are included in these regions) and each formulation's respective market share;
- The FuelFormulation Table defines the properties (such as RVP, sulfur level, ethanol volume, etc.) of each fuel;
- The FuelUsageFraction Table defines the frequency at which E-85 capable (flex fuel) vehicles use E-85 vs. conventional gasoline; and
- The AVFT Table is used to specify the fraction (other than the default included in the sampleVehiclePopulation Table) of fuel types capable of being used (such as flex fuel vehicles) by model year and source type.

In general, users should review/use the default fuel formulation and fuel supply data provided in MOVES, with important exceptions noted below. EPA strongly recommends using the default fuel properties for a region unless a full local fuel property study exists.

The GHG effects of changes in the fuel mix used by vehicles can be modeled in MOVES. AVFT can be used to change the fraction of future vehicles using gasoline, diesel, CNG and electricity. These changes will be reflected in MOVES GHG emission rates.

The FuelUsageFraction Table allows the user to change the frequency at which E-85 capable vehicles use E-85 fuel vs. conventional fuel, when appropriate. MOVES contains default estimates of E-85 fuel usage for each county in the U.S. In most cases, users should rely on the default information.

The AVFT Table allows users to modify the fraction of vehicles using different fuels and technologies in each model year. In other words, the Fuel Tab allows users to define the split between diesel, gasoline, ethanol, CNG, and electricity, for each vehicle type and model year. For transit buses, the default table assumes that gasoline, diesel, and CNG buses are present in the fleet for most model years. If the user has information about the fuel used by the transit bus fleet in the county modeled, the user should be sure it is reflected in the AVFT Table (EPA 2016). ***NOTE: This tab can be critically important in CDOT's GHG calculations. This is where electric vehicle percentages, etc. are defined. This tab may vary among CDOT's scenarios and should not be overlooked.***

APCD uses MOVES default data for fuel supply, fuel formulation, and fuel usage fraction for all years in their GHG models. For AVFT, APCD uses custom inputs that includes electric vehicles for all years. These were used for each year modeled.

Meteorology

Ambient temperature and relative humidity data are important inputs for estimating on-road GHG emissions with MOVES. Ambient temperature and relative humidity are important for estimating GHG emissions from motor vehicles as these affect air conditioner use. MOVES requires a temperature (in degrees Fahrenheit) and relative humidity (in terms of a percentage, on a scale from 0 to 100) for each hour selected in the RunSpec. EPA recommends that users input the average daily temperature profile for each month if they are modeling all 12 months. Temperature assumptions used for estimating on-road GHG emissions should be based on the latest available information. The MOVES database includes default monthly temperature and humidity data for every county in the country. These default data are based on average monthly temperatures for each county from the National Climatic Data Center for the period from 2001 to 2011. These national defaults can be used for a GHG inventory, or more recent data can be used (EPA 2016).

If the Emission Rate calculation type is chosen in the RunSpec, users can enter a different temperature and humidity for each hour of the day to create an emission rate table that varies by temperature for running emissions processes. Emission rates for all running processes that vary by temperature can be post-processed outside of MOVES to calculate emissions for any mix of temperatures that can occur during a day. This creates the potential to create a lookup table of emission rates by temperature for the range of temperatures that can occur over a longer period of time such as a month or year from a single MOVES run (EPA 2016).

MOVES default meteorology data was used for all years. The county used was Adams County, Colorado for the months of January and July. Emission rates were post-processed to average winter and summer emission rates.

Road Type Distribution

MOVES does not have default data for this input, so it must be developed. The fraction of VMT by road type varies from area to area and can have a significant effect on GHG emissions from on-road mobile sources. EPA expects states to develop and use their own specific estimates of VMT by road type (EPA 2016).

If the Emission Rates option is used, MOVES will automatically produce a table of running emission rates by road type. Running emissions would then be quantified outside of MOVES by multiplying the emission rates by the VMT on each road type for each source type in each speed bin. In that case, data entered using the Road Type Distribution Importer is still required, but is not used by MOVES to calculate the rate. However, road type distribution inputs are important for Emission Rates runs involving non-running processes, because they are used by MOVES to calculate the relative amounts of running and non-running activity, which in turn affects the rates for the non-running processes (EPA 2016).

APCD uses a custom road type distribution for all years in their GHG models. This was used for each year modeled. Since emission rates were calculated (as opposed to emission inventories), the road type distribution used in MOVES will not change the emission rates calculated. The road types are accounted for in the TDM.

Source Type Population

MOVES does not have default data for this input, so it must be developed. APCD uses a custom source type distribution for all years in their GHG models. These data were used for each year modeled. The source type populations used in MOVES will not change the emission rates calculated. However, source population data are still needed as inputs for an emission rates MOVES run.

Vehicle Type VMT

MOVES does not have default data for this input, so it must be developed. EPA believes VMT inputs have the greatest impact on the results of a state or local GHG or energy consumption analysis. Regardless of calculation type, MOVES requires VMT as an input. MOVES can accommodate whatever VMT data is available: annual or average daily VMT, by HPMS class or MOVES source type. Therefore, there are four possible ways to enter VMT, allowing users the flexibility to enter VMT data in whatever form they have. EPA recommends that the same approach be used in any analysis that compares two or more cases (e.g., the base year and a future year) in a GHG analysis (EPA 2016).

The Output Emission Detail panel determines the detail with which MOVES will produce emission rates for running emissions, such as by source type and/or road type in terms of grams per mile. Total emissions are quantified outside of MOVES by multiplying the emission rates by the VMT for each source type and road type. However, users will still need to enter data using the Vehicle Type VMT Importer that reflects the VMT in the total area where the lookup table results will be applied. This is necessary because MOVES uses the relationship between source type population and VMT to determine the relative amount of time vehicles spend parked vs. running (EPA 2016).

APCD uses HPMS as the source type and annual as the time span for their GHG models. This was used for each year modeled. Since emission rates were calculated (as opposed to emission inventories), the VMT used in MOVES will not change the emission rates calculated. The VMT values are in the TDM data. However, VMT data are still needed as inputs for an emissions rate MOVES run.

Inspection/Maintenance Program

If a model is examining any nonattainment/maintenance areas, an inspection and maintenance (I/M) program may apply. I/M program inputs should be those used for SIP and conformity analyses and are generally available as defaults within MOVES. However, if a user is modeling CO_2, N_2O, and/or elemental carbon emissions only, or modeling area where no I/M program applies, the user should check the box on this tab (EPA 2016).

APCD uses the check box for "No I/M Program" for the Statewide Transportation Plan, since there is not a statewide emissions program that applies in these areas. This was used for each year modeled.

Others

APCD assumes MOVES default values for the starts, hoteling, idle, retrofit data, and generic tabs. This was left as is for each modeled year.

Output Database

When a RunSpec is executed in MOVES, the results are stored in the output database specified in the "General Output" parameters. HeidiSQL (or equivalent software) can be used to view and export the calculated emission rates.

MOVES Rate per Distance Table

The critical table in the output database with the calculated emission rates was the "rateperdistance" table. It contained emission rates for each combination of month, hour, pollutant, road type, speed bin, and vehicle type as specified in the RunSpec. The MOVESScenarioID field was the mechanism used by FHU to identify the HPMS source type.

The table was filtered to include only CO_2e (i.e., pollutant ID 98) emission rates and exported to a comma-separated value (CSV) file. Because the table included emission rates for both January and July, and MOVES speed bins are not discrete speeds in miles per hour, post-processing of the emission rates was required to calculate emission inventories.

Processed Emission Rates

APCD provided several Access databases with calculation tools for processing the MOVES and TDM data. These Access databases are the basis for the post-MOVES data processing. The instructions contained below provide a narrative of what occurs, but these actions are already built into the Access databases.

The MOVES rate per distance output table needed to be manipulated to produce emission rates that could be related to the calculated vehicle speeds for road links in the TDM data. The emission rates for January and July needed to be averaged to create composite emission rates. The emission rates for the 16 speed bins (which cover 5 MPH ranges) in MOVES were linearly interpolated to provide emission rates for every mile per hour speed from 1 to 75, which is how speed data are presented in the TDM data.

The resulting table includes a total of 43,776 unique emission rates. That is, an emission rate for each combination of:

- MOVES Road Types 2-5
- HPMS Types 10/20/30/40/50/60
- Hours 1-24
- Speeds 1-75

Processing Annual Average Emission Rates

For each year/rate per distance table (i.e., this process must be repeated for 2025, 2030, 2040, and 2050):

- Filter to include only CO2e (pollutant ID 98) emission rates
- There were unique emission rates for each combination of:
  - Road type
  - HPMS type
  - Speed Bin
  - Hour
  - Month
- To get the average emission rates per year, each combination of road type, HPMS type, average speed bin, and hour were summed and divided by two (to average the corresponding emission rates for January and July)
- Seasonally averaged emission rate = (Winter Rate + Summer Rate)/2

Interpolating Emission Rates from Speed Bin to Integer Speeds

After seasonally averaging the emission rates, these rates were used to interpolate (linearly) between speed bins to get an emission of rate for every mile per hour for the speeds of 1 to 75 miles per hour. In general, the process used was:

- For adjacent speed bins, subtract the lower bin number emission rate from the higher bin number emission rate and divide by five to calculate a per mile per hour change in the emission rate (NOTE: emission rates generally decrease with increased speed)
- Add the appropriate emission rate change to the lower bin avgBinSpeed value to interpolate each mile per hour emission rate between the avgBinSpeed values
- For reference, the table below illustrates the MOVES speed bins
- Example for interpolating emission rate of 11 mph:
  - Speed per mph = 11 mph
  - Speed of Lower Speed Bin = 10 mph
  - Number of Speeds per Speed Bin = 5 (= 2.5 for speed bin 1; = 5 for all other speed bins)
  - ER of Lower Speed Bin = 4055 g/m (dummy data)
  - ER of Upper Speed Bin = 3421 g/m (dummy data)
  - 4055 + (3421 – 4055) * (11 – 10)/5 = 3928

avgSpeedBinID	avgBinSpeed	avgSpeedBinDesc
1	2.5	speed < 2.5mph
2	5	2.5mph <= speed < 7.5mph
3	10	7.5mph <= speed < 12.5mph
4	15	12.5mph <= speed < 17.5mph
5	20	17.5mph <= speed <22.5mph
6	25	22.5mph <= speed < 27.5mph
7	30	27.5mph <= speed < 32.5mph
8	35	32.5mph <= speed < 37.5mph
9	40	37.5mph <= speed < 42.5mph
10	45	42.5mph <= speed < 47.5mph
11	50	47.5mph <= speed < 52.5mph
12	55	52.5mph <= speed < 57.5mph
13	60	57.5mph <= speed < 62.5mph
14	65	62.5mph <= speed < 67.5mph
15	70	67.5mph <= speed < 72.5mph
16	75	72.5mph <= speed

Processed TDM

The TDM data are usually presented as an ESRI polyline shapefile format with each traffic link represented as one record (feature) and attributed with distances, total volumes, volumes per time period, and speeds per time period. A series of post-processing steps were performed to relate the relevant TDM data with the appropriate MOVES emission rates, as described below. The first step described below was done using ArcGIS. The other steps were done using the tools in the Access databases.

The resulting table includes aggregated VMT for each combination of:

- MOVES Road Types 2-5
- HPMS Types 10/20/30/40/50/60
- Hours 1-24
- Speeds 2.5-75

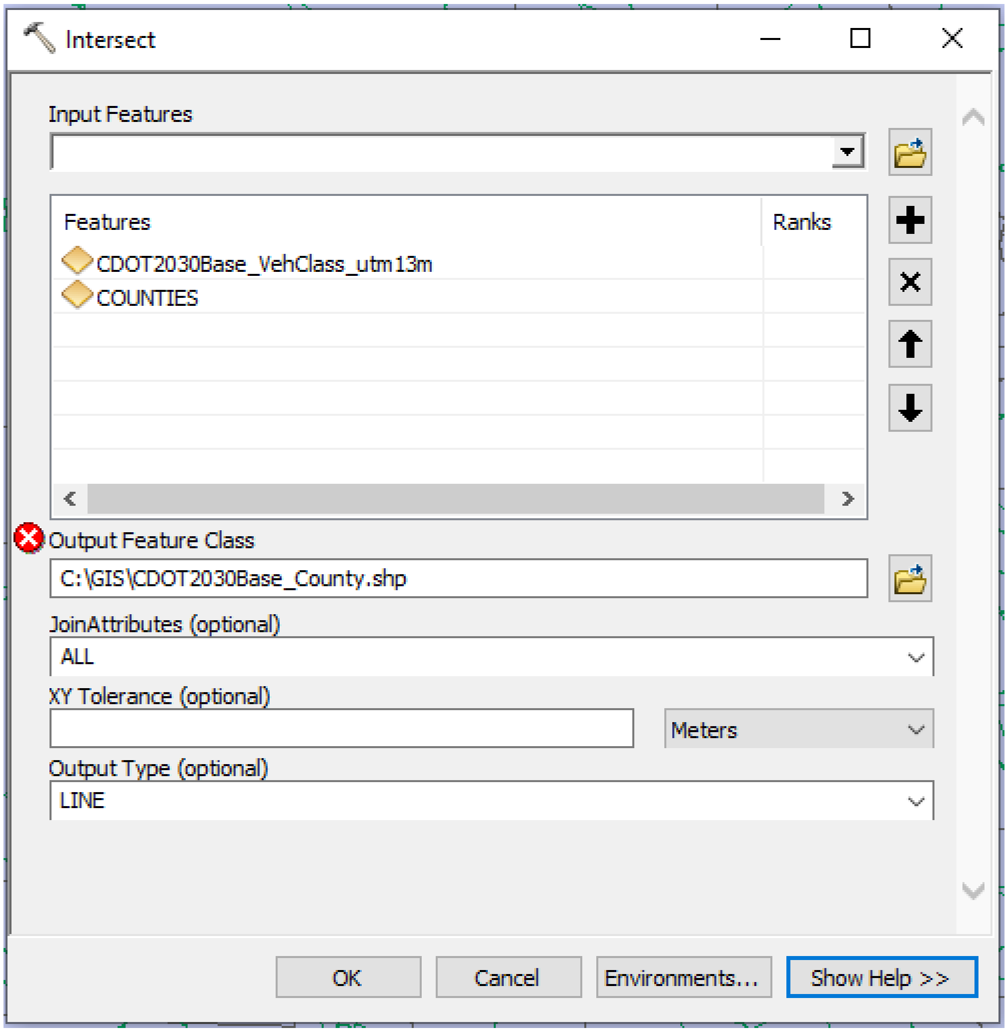
This process provides respective county names for each link to aggregate VMT by geography/region.

Attribute TDM with County Name

The first step was to attribute each link with the county name. The county information was necessary because it was used later in the process to filter VMT (and thus, on-road emissions inventory) by geography/region (e.g., MPO or non-MPO traffic). Performing this step later in the process would require significant modifications to the process.

The ArcGIS geoprocessing tool "Intersect" was used to attribute the TDM shapefile with county names for each roadway link (feature). The Input Features were the TDM shapefile and CDOT's "COUNTIES" shapefile that can be downloaded from OTIS. Unnecessary fields in the counties shapefile were deleted, so that the fields remaining were FID, Shape*, COUNTY, and CO_FIPS. The Output Feature Class name and file path could change, depending on the user's preference. The Join Attributes parameter was set to "ALL" which kept attributes from both input features. The Output Type parameter was set to "LINE" which set the output feature class to be the geometry of the TDM shapefile. The Environment was defaults except for the Output

Coordinate System. That was set to the projected coordinate system, "GRS_1980_UTM_Zone_13N" which matched the TDM shapefile's coordinate system.



The resulting output feature class had the same geometry and attributes as the TDM shapefile except for the following changes:

- Each link was attributed with the county name and FIPS number.
- Links within multiple counties were split (divided) into separate features at the county line(s). In these cases:
    - Both features still had the same attributes except for the county name and FIPS.
    - The distance attribute in the "DIST" field was now invalid since the feature was split.

To account for changes in distances for links that were in multiple counties, a new field "cntyMiles" was added to the output feature class. The geoprocessing tool "Calculate Geometry" was used on the "cntyMiles" field to calculate the distance of each link in miles. The "cntyMiles" field, rather than the "DIST" field, was used later in Access to calculate VMT.

The resulting attribute table was saved as a CSV file and used in the following steps.

Access Database

The TDM CSV file from the step above was imported into an Access database. The remaining post-processing steps were performed in this Access database, as described below.

Speeds

The TDM speeds were in floating decimal format and rounded to the nearest integer. Speeds less than 2.75 mph were rounded to 2.5 mph. This was because emission rates for speeds of 2.5 mph or less were the same, as described in the Processed Emission Rates section.

Time Periods

The TDM model provides aggregated data for 10 blocks of time for a day, not hour by hour—see the "name" column below. The data for these TDM periods were recategorized/interpolated into data for discrete clock hours 1-24 based on methodology from APCD.

The PeriodHour24 table below was used to split the TDM data for different time periods (AM1, PM2, OP1, etc.) into 24 clock hour time periods. VMT was calculated for each combination of integer speed (2.5 – 75mph), interstate (yes or no), road functional class (1-8), rural (yes or no), periodCog (1-10), and county.

The periodCog 1-10 were related to hours 1-24 as shown in the “hour” column. That provided a VMT per clock hour for each combination of speed and functional class. This was used to relate the VMT to fractions of VMT by HPMS per functional class and hour.

The cVMT was divided by the number of “periods” corresponding with each clock hour to calculate the VMT.

PeriodHour24

Interval	periodCog	name	hour	hrsT	periods
11:00 PM - 6:30AM	7	Op1.bin	1	7.5	7
11:00 PM - 6:30AM	7	Op1.bin	2	7.5	7
11:00 PM - 6:30AM	7	Op1.bin	3	7.5	7
11:00 PM - 6:30AM	7	Op1.bin	4	7.5	7
11:00 PM - 6:30AM	7	Op1.bin	5	7.5	7
11:00 PM - 6:30AM	7	Op1.bin	6	15	7
6:30-7:00 AM	1	Am1.bin	7	1	1
7:00-8:00 AM	2	Am2.bin	8	1	1
8:00-9:00 AM	3	Am3.bin	9	1	1
9:00 AM - 11:30 AM	8	Op2.bin	10	2.5	2.5
9:00 AM - 11:30 AM	8	Op2.bin	11	2.5	2.5
	9	Op3.bin	12	3.5	7
	8	Op2.bin	12	2.5	5
11:30 AM - 3:00 PM	9	Op3.bin	13	3.5	3.5
	9	Op3.bin	14	3.5	3.5
	9	Op3.bin	15	3.5	3.5
3:00-5:00 PM	4	Pm1.bin	16	2	2
3:00-5:00 PM	4	Pm1.bin	17	2	2
5:00-6:00 PM	5	Pm2.bin	18	1	1
6:00-7:00 PM	6	Pm3.bin	19	1	1
7:00-11:00 PM	10	Op4.bin	20	4	4
7:00-11:00 PM	10	Op4.bin	21	4	4
7:00-11:00 PM	10	Op4.bin	22	4	4
7:00-11:00 PM	10	Op4.bin	23	4	4
11:00 PM - 6:30AM	7	Op1.bin	24	7.5	7

Fraction of VMT by HPMS

Once VMT was calculated for each road functional class and clock hour, the fractions of VMT by HPMS for each corresponding functional class and clock hour were applied. This calculated the VMT for HPMS 10-60. The fractions used were from APCD and were consistent with their methodology.

FractionsByHourHPMSnaaT

NAA?	Weld?	Rural?	FC	Hr	10f	20f	30f	40f	50f	60f
-1	W	R	1	1	1.12494375281236E-03	0.442984079764564	0.408981870287873	8.24958752062397E-04	3.60606876834793E-03	0.14247807867434
-1	W	R	1	2	6.50325162581291E-04	0.418107821883677	0.388118179039889	1.40070035017509E-03	5.57032759041272E-03	0.186152645973265
-1	W	R	1	3	1.1907462009526E-03	0.402448608970853	0.376594285267901	1.9278748015423E-03	8.86488378110699E-03	0.208973600977645
-1	W	R	1	4	1.88772529102432E-03	0.400795540811441	0.375296865809669	3.5956672209987E-03	8.74568726325532E-03	0.209678513603612
-1	W	R	1	5	1.27600843728028E-03	0.438002933384539	0.406922735865401	8.59352621025494E-04	5.91653137282429E-03	0.14702243831893
-1	W	R	1	6	9.86892049192773E-04	0.462978652961131	0.429325812630245	1.88521686320158E-03	5.20852159466524E-03	9.96149039015637E-02
-1	W	R	1	7	8.56477631797771E-04	0.47063947538398	0.437825973989187	1.19740562115417E-03	7.50554404406707E-03	8.19751233298142E-02

Road Types

The TDM used roadway functional classes that were recategorized to MOVES road types. That allowed the road types from the TDM to be related to the emission rates.

RTt

DRCOG Facil	FHWA facility type	rural?	FHWA	Urban	MOVESrt	fhwaRT	fcCode	Intestate
1	Principal Arterial - Interstate	-1	R	R	2	1	1	1
1	Principal Arterial - Interstate	-1	R	R	2	1	1	0
1	Principal Arterial - Interstate	0	N	U	4	11	1	0
1	Principal Arterial - Interstate	0	N	U	4	11	1	1
2	Principal Arterial - Other	-1	N	R	3	2	2	0
2	Principal Arterial - Other Freeways or Expressway	0	N	U	4	12	2	0
3	Principal Arterial - Other	-1	N	R	3	2	3	0
3	Principal Arterial - Other	0	N	U	5	14	3	0
4	Minor Arterial	-1	N	R	3	6	4	0
4	Minor Arterial	0	N	U	5	16	4	0
5	Major Collector	-1	N	R	3	7	5	0
5	Collector	0	N	U	5	17	5	0
6	Principal Arterial	-1	R	R	2	1	1	0
6	Principal Arterial	0	N	U	4	11	1	0
8	Local System	-1	N	R	3	9	7	0
8	Local System	0	N	U	5	19	7	0

Filter by Geography/Region

The statewide GHG inventory was filtered to contain VMT for all counties in Colorado except for the nine-county region in the ozone non-attainment area. The nine counties excluded were Adams, Arapahoe, Boulder, Broomfield, Denver, Douglas, Jefferson, Larimer, and Weld. The statewide results were subdivided further into Pikes Peak area and the rest of the state.

Emissions Inventory

The processed emission rates table and the processed VMT table were related by road type, HPMS type, hour, and speed. This relate was used to multiply the emission rate (g/mi) by the VMT (mi) to get a total in grams of CO2e for an average weekday. The formula used was:

- CO2e (g/day) = SUM(Emission Rate (g/mi) * VMT (mi))
- CO2e (MMt/day) = CO2e (g/day) * 1 (MMt) / 1e+12 (g)
- CO2e (MMt/year) = CO2e (MMt/day) * 338 (TDM weekdays/calendar year)

The calculated emissions inventory was for on-road emissions. Non-road emissions were not included in this calculation.

References

EPA. 2016. *Using MOVES for Estimating State and Local Inventories of On-road Greenhouse Gas Emissions and Energy Consumption*. June. https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100OW0B.pdf

CDOT

COLORADO

Department of Transportation

US 50 Blue Mesa Bridges ER Project

Blue Mesa Bridges General Information

K-07-A

- US 50 over the Lake Fork at mile marker 132.69
- 6 Span, Continuous Composite Welded Girder bridge. 993ft, 300ft max span
- Spans 3, 4, and 5 are Non-redundant Steel Tension Members (NSTM).
- 2 total lanes, 1 lane each direction
- Built 1963, FAIR Condition

K-07-B

- US 50 over the Blue Mesa Reservoir at mile marker 136.16
- 10 Span, Continuous Composite Welded Girder bridge. 1,532ft, max span 360ft
- Spans 5, 6, and 7 are Non-redundant Steel Tension Members (NSTM).
- 2 total lanes, 1 lane each direction
- Built 1963, FAIR Condition

Response Goals

Overall goal: safety
- Site safety (workers, weather, communications)
- Public safety

Short-term goal
- Facilitate emergency ambulance service on bridge

Mid-term goal
- Facilitate local traffic on a small interval basis

Long-term goal
- Structural integrity of structure for legal loads

Keys to Success

- Communication, communication, communication!
- Commitment to the goals and success of the project
- Knowledgeable and experienced team of experts
- Cooperation with key stakeholders (other agencies, etc.)
- Partnership with Gunnison County

Key milestone dates/timeline

- April 18, 2024 – In-depth inspection using Ultrasonic Testing (UT) of the buttweld resulted in **full closure** of Middle Bridge to all traffic (FHWA & CDOT)
- April 22, 2024 – County Road 26 was opened for limited traffic crossings
- April 23, 2024 – Governor Polis issued a Disaster Emergency Declaration
- July 3, 2024 – Middle Bridge opened to limited traffic (EMS/passenger vehicles)
- July 25, 2024 – County Road 25 improvements completed
- July 29, 2024 – Began mitigation repair work on Lake Fork Bridge
- October 16, 2024 – Middle Bridge open to all traffic without traffic control
- December 6, 2024 – Lake Fork Bridge open to all traffic without traffic control

US 50 Blue Mesa Reservoir ER Project

- 410 tons of added plate steel
- 51,504 bolts

Recognition – Region 3 Section 2 Maintenance

John David
Fred Cummings
TJ Blake
Eric Langford
Mark Bacialli
Heath Smith
Jeff Lathrop
Kevin Johnson
RE Hall
Billy Painter
Jonathan Broadway
Shawn Hutchins
Ted Sharsmith
Justin Mangum
Jose Pacheco
Juan Martinez
Bryan Kieg
Clint Prosser

Bruce Hillis
Marcus Couch
Jared Kehmeier
Steve Hanson
Tom Fick
Tim Valdez
Brandon Hartzo
Shaquille Braley
West McKee
Guy Clark
Kenna Baecker
Chris Brown
Cody Jordan
Dan Finholm
Lucas Kirkpatrick
Rick Baecker
Greg Meeker
Dan Sanchez

Kelly Coon
Dan (Paul) Sowell
Danny Lange
Ryan Conrad
Mike Secula
Kenny Tomlin
Kaleb Baugh

Recognition – Region 3 Engineering

RTD

Jason Smith

Program West Engineering

Rob Beck, Program Engineer

Nathan Jean, Montrose RE

Matt Casey, Design Manager

Brenan Sellers, PE

Justin Eller, EIT

Business Office

Brian Boydstun, Manager

Kim Medina, Admin

Tina Sharer, Proj Manager

Civil Rights Office

Rebekah Renner, Admin

Environmental

Jennifer Klaetsch, EPS

Cinnamon Levi-Flinn, EPS

Recognition – Staff Bridge

CDOT Staff Bridge

Samuel Abraham
Mike Bean
Andrew Brown
Natasha Butler
Michael Collins
Lynn Croswell
Ahmed Ibraheem
James Jones
James Ricci
Greg Marcuson
Carnot Nogueira
Jacob O’Brien
Andrew Pott
Ryan Sullivan-Hope

Recognition - Headquarters

Executive Management

Shoshana Lew
Herman Stockinger
Sally Chaffee
Keith Stefanik
Robert Hays
Matt Inzeo

Communications

Stacia Sellers

Bridge Enterprise

Patrick Holinda

Statewide Emergency Manager

Patrick Chavez

Federal Highway Administration (FHWA)

John Cater
Andy Wilson
Spencer Tucker

Recognition – Contractors & Consultants

Kiewit Infrastructure
Jason Proskovec
Chet Haptonstall
Reid Korbelik
Adam Geis
Anton Hocevar

Michael Baker
Keely Matson
Rich Schoedel
Aaron Stover
Johan Aakre

Benesch
Jess Hastings

Stantec
Tom Marzolf

BDI
Shane Boone

CIG
Kristi Estes
Joy Wasendorf
Brenda Tierney

Recognition - Subcontractors

AFCO Steel

Michael Noernberg

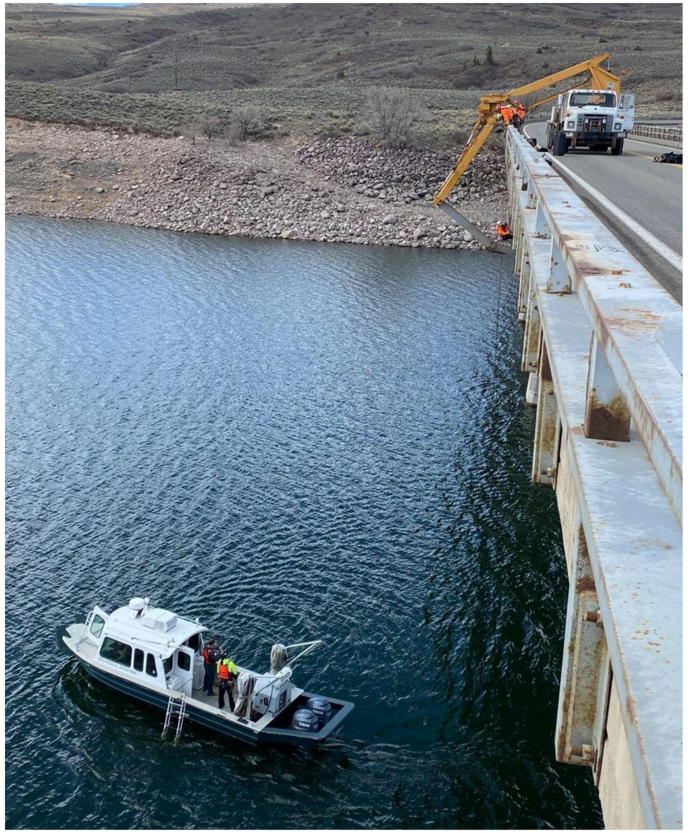
Brand Safeway

Alec Ebel

Coating Specialists

Christian Vigil

CC Enterprises



Recognition – Counties, Towns, Community

Gunnison County Commissioners

Gunnison County staff

- Matthew Bernie
- Martin Schmidt

Montrose County Commissioners

Hinsdale County Commissioners

City of Gunnison

City of Montrose

Sapinero Community

All affected community members

Transportation Commission Memorandum

To: The Transportation Commission
From: Jeff Sudmeier, Chief Financial Officer
Date: January 15, 2025

Subject: Monthly Cash Balance Update

Purpose

To provide an update on cash management, including forecasts of monthly revenues, expenditures, and cash balances for the State Highway Fund, SB 17-267 Trustee Account, and American Rescue Plan Act funds.

Action

No action is requested at this time.

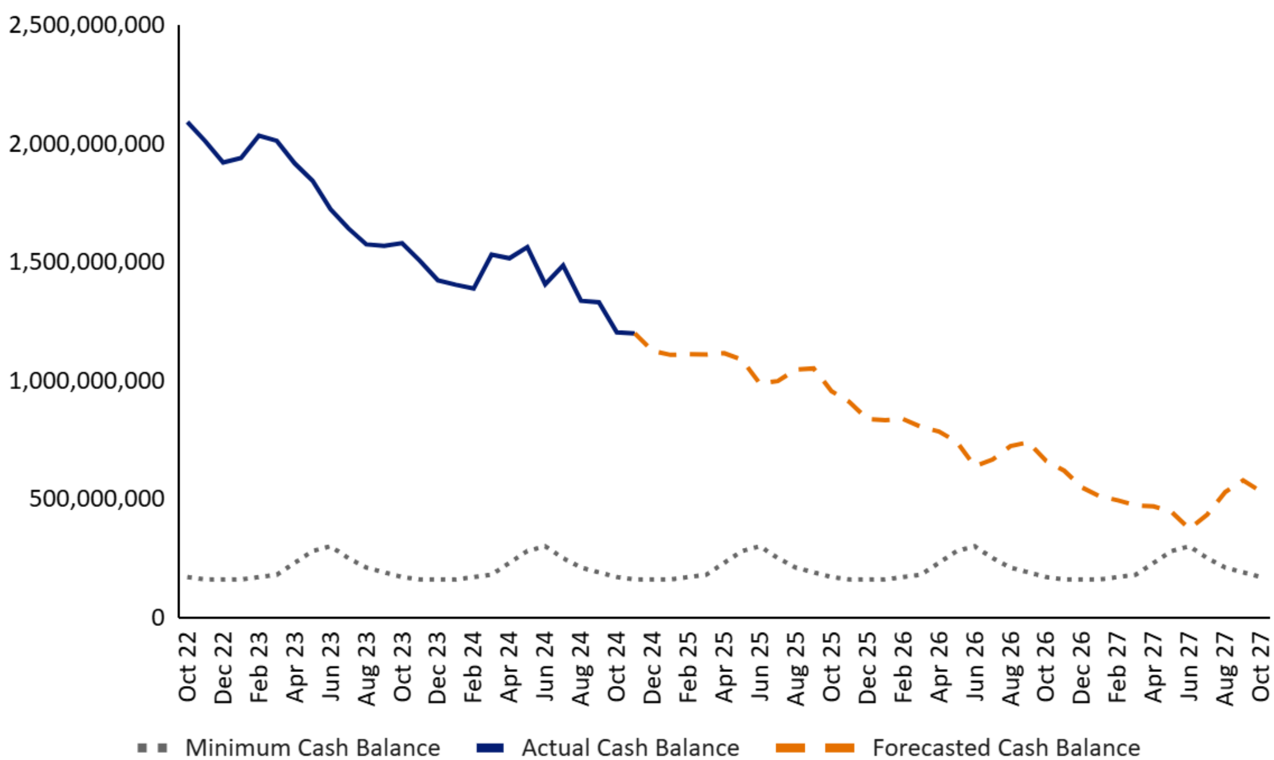
Summary

The actual cash balance for November 2024 was $1.20 billion; $1.04 billion above that month's minimum cash balance target of $160.00 million. November's cash balance includes $566.75 million in the State Highway Fund and $635.81 million in the Senate Bill 267 trustee account.

Figure 1 below outlines the Department's 36-month cash forecast. The primary drivers in this forecast include revenue from the state Highway Users Tax Fund (HUTF), federal reimbursements, payments to contractors, and General Fund transfers made pursuant to SB 21-260.

The Fund 400 Cash Balance is expected to gradually decrease over the forecast period as projects funded with SB 17-267 and other legislative sources progress through construction. The sections below provide additional information on the revenues and expenditures forecasted for this memo.

Figure 1 - Fund 400 Cash Forecast



Cash Balance Overview

The Transportation Commission's directive (Policy Directive 703.0) outlines targeted minimum cash balances to limit the risk of a cash overdraft at the end of a month to, at most, a probability of 1/1,000 (1 month of 1,000 months ending with a cash overdraft). The forecasted cash balance is expected to remain above the targeted minimum cash balance through the forecast period.

The cash balance forecast is limited to the State Highway Fund (Fund 400 and affiliated funds and trustee accounts). This forecast does not include other statutory Funds, including the Multimodal Mitigation and Transportation Options Fund and funds associated with CDOT enterprises.

Revenue Sources Forecasted

The State Highway Fund revenues forecasted in this cash balance include:

- Highway Users Tax Fund - This primarily includes Motor Fuel Taxes, Vehicle Registration Fees, Road Usage Fees, and Retail Delivery fees.
- Miscellaneous State Highway Fund Revenue - This revenue includes proceeds from the sale of state property, interest earned on balances in the cash fund, the issuance of oversize/overweight permits, and revenue from various smaller sources.
- SB 17-267 - This bill directed the State Treasurer to execute lease-purchase agreements on existing state facilities to generate revenue for priority transportation projects.

- General Fund Transfers- Pursuant to SB 21-260, annual General Fund transfers will be made to the State Highway Fund between FY 2024-25 to FY 2031-32. This cash forecast assumes these transfers will be made in July of each year.

Expenditure Sources Forecasted

The State Highway Fund expenditures forecasted in this cash balance include:

- Payments to construction contractors (described in more detail in the section below)
- Staffing expenses and program-related professional services
- Right of Way Acquisition
- Debt Service
- Transfers between CDOT and other state entities
- Maintenance and facilities expenditures
- Grant expenditures
- Other expenditures related to services and equipment.

Cash Payments to Construction Contractors

The current forecast of payments to construction contractors under state contracts (grants paid out under inter-government agreements for construction are accounted for elsewhere in the expenditure forecast) from Fund 400 is shown in Figure 2 below.

Figure 2 - Cash Payments to Construction Contractors (millions)

CY 2019 (actual)	CY 2020 (actual)	CY 2021 (actual)	CY 2022 (actual)	CY 2023 (actual)	CY 2024 (forecast)
$669	**$774**	**$615**	**$841**	**$860**	**$801***

*This is a preliminary forecast that will be updated as additional project schedule detail becomes available.

Figure 3 details CY23 baseline and actual expenditures for the State Highway Fund (see Figure 2 above) as well as Bridge and Tunnel Enterprise. CDOT sets the CY baseline in January each year, using the best estimates, forecast, and schedule information available at the time.

Including Bridge Enterprise, November month end expenditures were corresponding to an Expenditure Performance Index (XPI) of 1.07 (actual expenditures vs. baseline). There were $780.8M actual expenditures YTD vs. the baseline of $732.9M. The CY 23 baseline included expenditures from 169 projects, while the current CY 24 baseline includes expenditures from 196 projects. Figure 4 details the current CY24 baseline and actual expenditures.

Figure 3 - Dashboard View, CY 23 Year End

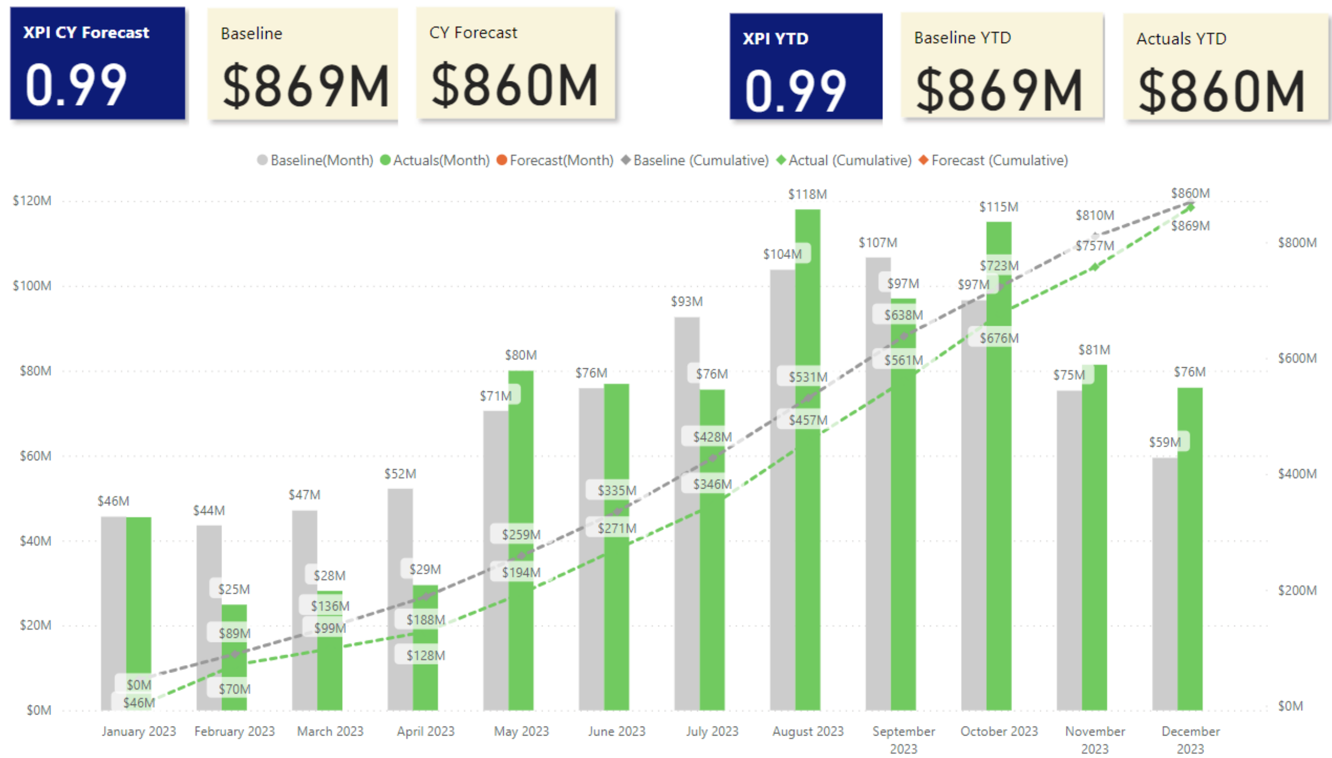
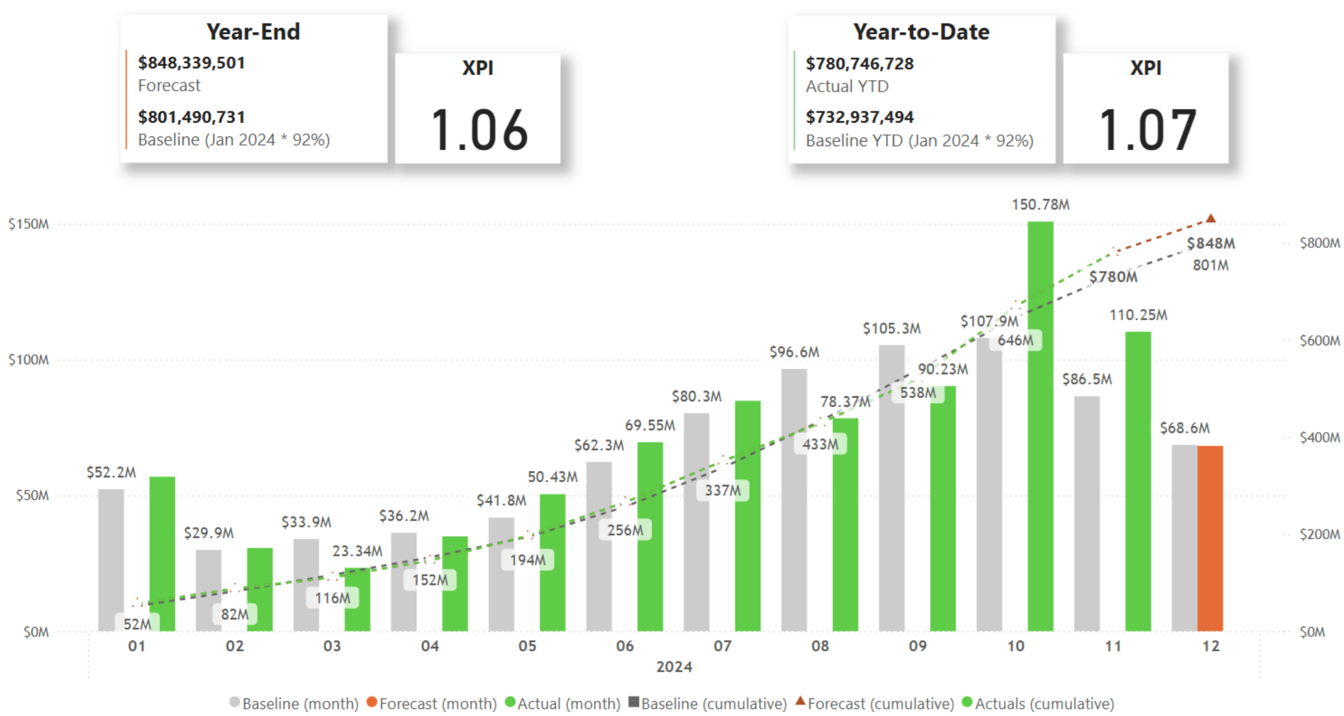


Figure 4 - Dashboard View, CY 24



Transportation Commission Memorandum

To: The Transportation Commission
From: Jeff Sudmeier, Chief Financial Officer
Ryan Long, Revenue and Policy Analyst
Date: January 15, 2025

Subject: FY 2024-25 Q2 Highway Users Tax Fund Forecast

Purpose
To provide a quarterly update to the annual Highway User Tax Fund (HUTF) revenue forecast.

Action
This is for information purposes only. No action is requested from the Transportation Commission at this time.

Background
The Office of Financial Management and Budget (OFMB) maintains an annual revenue model that is used to guide CDOT's budget-setting process. OFMB's revenue team updates the model each quarter to monitor the course of a current year's fiscal performance, as well as inform the budget for future out-years. Some of the data used by the model includes, but is not limited to:

- Historical performance of fee revenues
- National economic performance indicators, such as the year-over-year percent change in real U.S. GDP growth
- Inflation estimates based on data from Moody's and the National Highway Cost Construction Index (NHCCI)
- State population and demographic data from the Department of Local Affairs
- Data on annual vehicle miles traveled (VMT) in Colorado from the CDOT Division of Transportation Development
- Estimated vehicle costs, including federal or state rebates for certain vehicles
- Vehicle sales and energy consumption data from the Energy Information Administration
- State fleet data from the Colorado Department of Revenue
- Colorado Clean Cars standard as baseline for estimation of electric vehicle adoption

The Department develops the Annual Revenue Allocation Plan using outputs from this model. During the annual budget development process, CDOT staff reconcile annual projected revenues with approved requests for expenditures. Staff provides draft and final versions of the Revenue Allocation Plan for formal review and approval by the Transportation Commission. The final plan becomes CDOT's official budget for the next fiscal year.

Changes from the Previous Forecast

OFMB reduced its forecast for fuel tax and fee revenue compared to the previous quarter. Based on data through November, the revenue from actual fuel taxes and fees has been underperforming compared to recent fiscal years. OFMB will continue to monitor this revenue and make adjustments as needed in future quarters. The table below outlines the forecasted change to CDOT's HUTF revenue resulting from these changes.

Changes to CDOT HUTF Revenue (millions)

Fee	FY 25 Q1 Forecast	FY25 Q2 Forecast	Variance
CDOT First Stream Revenue	$121.3	$117.8	-$3.5
CDOT Second Stream Revenue	$398.1	$389.5	-$8.7
CDOT FASTER	$141.4	$141.4	$0.0
Statewide HUTF Revenue	**$660.8**	**$648.6**	**-$12.2**

Summary

The tables below summarize CDOT's FY 2024-25 Q2 statewide HUTF forecast. Revenue increases in future years are primarily attributed to increased revenue from FASTER fees, the Road Usage Charge, Electric Vehicle fees, and the Retail Delivery Fee. A more detailed forecast narrative can be found on CDOT's website.

Statewide HUTF Forecasted Revenue (millions)

Revenue Source	FY 2024-25	FY 2025-26	FY 2026-27
Motor Fuel Taxes	$645.3	$655.3	$662.1
Vehicle Registration Fees	$247.2	$253.2	$262.6
FASTER Collections	$235.6	$240.3	$245.0
Road Usage Fee	$119.2	$151.3	$183.5
Miscellaneous Collections	$32.3	$32.3	$32.3
Retail Delivery Fee	$23.0	$25.7	$28.6
Statewide HUTF Revenue	**$1,302.6**	**$1,358.1**	**$1,414.1**

Statewide HUTF Forecasted Distributions (millions)

Recipient	FY 2024-25	FY 2025-26	FY 2026-27
Off-the-Top Appropriations	$213.2	$225.7	$238.9
CDOT	$662.9	$687.7	$712.3
DNR Capital Construction	$0.3	$0.3	$0.3
Counties	$246.7	$256.1	$265.5
Municipalities	$179.6	$188.3	$197.2
Total HUTF Distributions	**$1,302.6**	**$1,358.1**	**$1,414.1**

Proposed CDOT Decision Item

CDOT submitted a Decision Item in the FY 2025-26 November 1 Legislative Budget Submission asking for a reduction to CDOT's HUTF FASTER revenue. The table below summarizes the potential revenue impact of this decision item. Any actual change to CDOT revenue will depend on decisions made by the Colorado General Assembly during the annual budget process.

Proposed CDOT Legislative Decision Items (millions)

Decision Item	FY 2025-26 Current Law	FY 2025-26 Proposed Reductions	Difference
R-04 - Reduce Road Safety Surcharge and Distribution	$90.8	$25.7	-$65.1

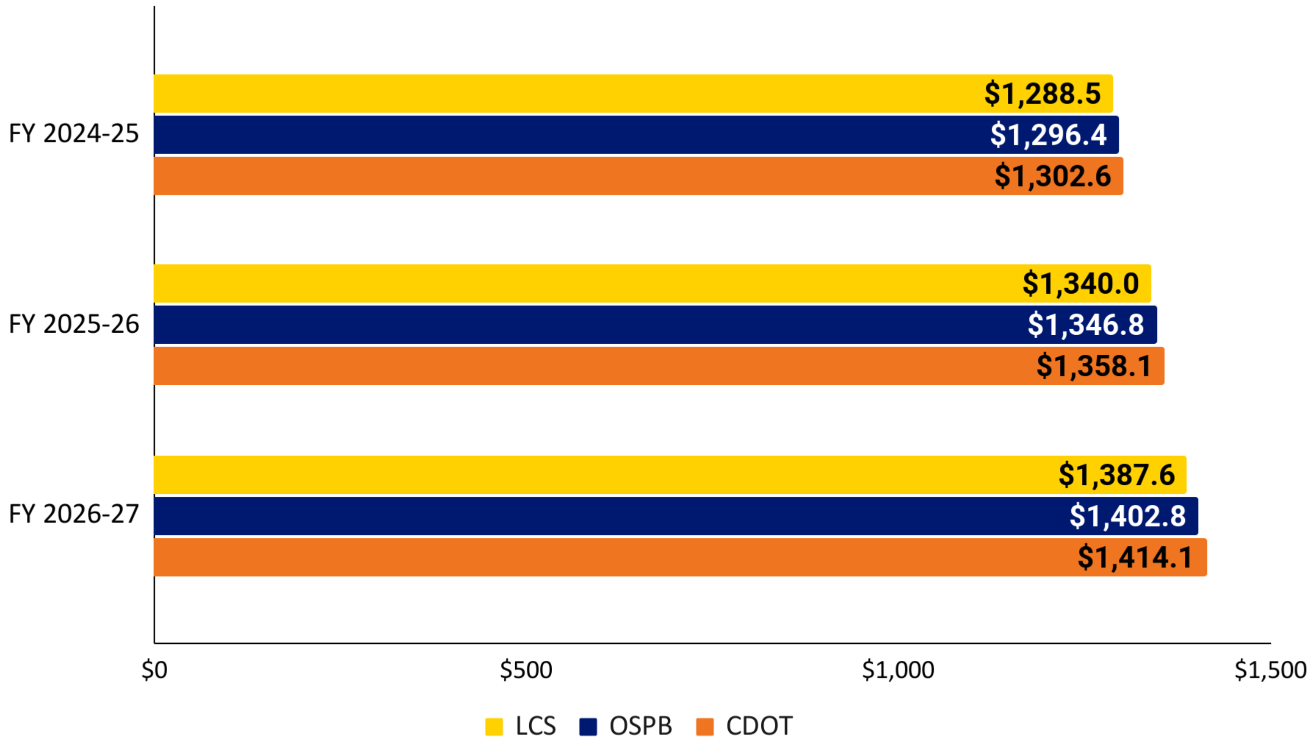
R-04 Reduce Road Safety Surcharge and Distribution Update - The Department proposed a reduction to the Road Safety Surcharge, resulting in a decrease in revenue subject to TABOR. To achieve this, the Department of Transportation requests a $11.10 reduction to all weight-based fee tiers of the Road Safety Surcharge, resulting in a $65.1 million decrease to FASTER revenue. This will decrease the State's total cash fund revenue subject to TABOR, which will increase General Fund availability in FY 2025-26. This proposal would modify the HUTF distribution formula to ensure that county and city HUTF distributions are not reduced.

Statewide Forecast Comparison

The forecasts presented by OSPB and LCS are used as the basis for statewide budget planning, and both forecasts estimate statewide transportation revenue.

CDOT's budget is primarily driven by the Revenue Allocation Plan approved by the Transportation Commission, which is developed using CDOT's independent quarterly forecast. The chart below provides a comparison of CDOT's forecast to the other statewide forecasts.

Statewide HUTF Forecast Comparison (millions)



Transportation Revenue and TABOR

TABOR, which was approved by voters in 1992, limits the amount of revenue that the state can retain and spend. Both OSPB and LCS are forecasting that state revenue will surpass the TABOR cap through at least FY 2025-26. In general, increasing cash fund revenue is putting pressure on the state budget. Since TABOR refunds are paid with General Fund, any increase in state cash fund revenue will decrease the availability of General Fund in future years.

The primary revenue sources driving the increase in state cash fund revenue include transportation revenues from SB 21-260 fees, severance tax revenues, and several smaller cash funds. The decreasing availability of the General Fund may reduce future General Fund transfers to the State Highway Fund. Any actual changes would depend on actions taken by the General Assembly to balance the budget.

Transportation Commission Memorandum

To: Colorado Transportation Commission
From: Anna Dunn, Grants Coordinator in OPGR
Date: January 16, 2025

Subject: Update to the Transportation Commission on CDOT's submitted, in progress, and forthcoming grant applications

Purpose

To share progress on submitted applications, as well as current and future coordination of proposals to anticipated federal discretionary programs, primarily under the Infrastructure Investment Jobs Act (IIJA).

Action

Per PD 703.0, when the department intends to apply for grants with a match consisting of previously approved funding, no action is necessary by the Commission, but if the match requires an additional commitment of funds not already approved by the Commission, or Bridge & Tunnel Enterprise (BTE), staff brings the projects to the Commission as an action item, with the additional funding being made contingent on a successful application and grant award.

For the January Commission meeting, the Grants Department is requesting approval to dedicate $5,352,000 from the Transportation Commission's Program Reserve funds, which will be budgeted contingent on grant award.

Furthermore, an overview of grants being currently pursued is included below. As always, Commissioners and CDOT staff are encouraged to contact CDOT's in-house grant team with questions, comments, and suggestions.

Background

For information on closed 2022 and 2023 grant programs and awarded proposals, please refer to archived TC Grants Memos from December 2023 or prior.

The following discretionary grant programs have closed and awards have been announced:

1. MULTIMODAL PROJECT DISCRETIONARY GRANTS (MPDG): A multi-billion dollar "umbrella" program that contains Mega, INFRA, and Rural Surface Transportation.
    - I-76 Phase IV Reconstruction in Region 4
        - $29.1M Awarded!
    - US 160 Safety & Mobility Improvements in Region 5
        - $58.9M Awarded!
2. RECONNECTING COMMUNITIES AND NEIGHBORHOODS (RCN)

    - Federal & Colfax Cloverleaf Interchange Planning Grant in Region 1
        - $2M Awarded!
3. STRENGTHENING MOBILITY AND REVOLUTIONIZING TRANSPORTATION (SMART)
    - I-25 Coordinated Adaptive Ramp Metering (CARM) Expansion in Region 1
        - $1.4M Awarded!
4. RAISE
    - I-270 & Vasquez Interchange Planning in Region 1 w/ Adams County
        - $4.8M Awarded!
5. BIP Planning
    - CO 96 Critical Bridges Replacement Feasibility Analysis
        - $760,000 Awarded!
6. 5339s (Low-No Emissions and Bus & Bus Facilities)
    - CDOT submitted applications for 11 agencies, and were awarded the following to support local agencies in grant administration and project delivery:
        - $1,951,080 awarded for Telluride to modernize the Galloping Goose Transit Maintenance Facility
        - $418,359 awarded for Archuleta County Mountain Express Transit to build a new park-and-ride facility in Aspen Springs, and support a new bus route from Aspen Springs to Pagosa Springs, Bayfield, and Durango.
        - $4,573,000 awarded for Eagle Valley Transportation Authority to buy hybrid-electric buses to replace older diesel vehicles
        - $32,837,664 awarded for Roaring Fork Transportation Authority (RFTA) to modernize its Glenwood Springs Operations and Maintenance Facility to support its planned zero-emission bus fleet.
        - $659,089 awarded for Durango Transit to replace aging buses and improve safety at several bus stops
        - $1,516,108 awarded for Gunnison Valley Rural Transportation Authority to purchase new buses and expand the Gunnison Valley RTA's fleet.
7. MULTIMODAL PROJECT DISCRETIONARY GRANTS (MPDG): A multi-billion dollar “umbrella” program that contains Mega, INFRA, and Rural Surface Transportation.
    - US 287 Corridor Safety Project in Region 4
        - $47.2M Awarded!
8. CONSOLIDATED RAIL INFRASTRUCTURE & SAFETY IMPROVEMENTS (CRISI) GRANT PROGRAM
    - Modernizing Rail on the Front Range: PTC Installation & Grade Crossing Safety and Operational Improvements
        - $66.4M Awarded!
9. ADVANCING DIGITAL CONSTRUCTION MANAGEMENT SYSTEMS (ADCMS)
    - Revised application to establish CDOT’s first vehicle-mounted LiDAR and Photogrammetry program.
        - $1.44M Awarded!

The following discretionary grant programs have closed, but applications are still being reviewed:

1. BRIDGE INVESTMENT PROGRAM (BIP) - LARGE BRIDGE
    - CDOT revised the Region 1 I-270 Corridor Improvements Bridge Bundle application
2. ADVANCED TRANSPORTATION TECHNOLOGY and INNOVATION (ATTAIN)

- CDOT's Traffic Safety and Engineering Services Branch submitted an application to purchase equipment, software, and training materials to establish CDOT's first LiDAR and Photogrammetry technology program.

3. CONGESTION RELIEF PROGRAM (CRP)
    - The Federal Blvd BRT Service Builder Project in Region 1
4. VEHICLE TECHNOLOGIES OFFICE (VTO) TECHNOLOGY INTEGRATION (TI)
    - OIM submitted two applications to two different "areas of interest"
        - Community-Driven Data Solutions: Using Advanced Artificial Intelligence to Address Transportation Equity in Colorado
        - Colorado ZEV Emergency Responder Safety Training Program
5. MULTIMODAL PROJECT DISCRETIONARY GRANTS (MPDG): Rural Surface Transportation grants are still under review, even though Mega and INFRA have been awarded.
    - Kings Valley Drive & US 285 Grade-Separation in Region 1 w/ Jefferson County
    - US 50 Safety & Highway Improvements for Freight and Travel (SHIFT) in Region 2 w/ Otero County
    - State-Wide Avalanche Protocol (SWAP) in Regions 3 & 5
    - US 550 & Animas River Crossing Project in Region 5 w/ La Plata County
6. ACTIVE TRANSPORTATION INFRASTRUCTURE INVESTMENT PROGRAM (ATIIP)
    - CO 7 Bike and Ped Improvements in Regions 1 & 4
    - Bridging Denver Area Network Gaps in R1
    - CO 145 Rural Active Connection and Equity in R5
7. RAILROAD CROSSING ELIMINATION (RCE)
    - US 40 Crossings East & West of Craig Planning Project in R3
8. RECONNECTING COMMUNITIES PROGRAM (RCP)
    - Federal Blvd & US 36 BRT Connection Planning Project in R1
    - US85 Bridge Replacement & Multimodal Connections – Venetucci Blvd to Fountain Creek in R2
9. BRIDGE INVESTMENT PROGRAM (BIP) - PLANNING
        - I-70 West Applewood to Lakewood Critical Bridges Planning in R1
10. BRIDGE INVESTMENT PROGRAM (BIP) - OTHER than LARGE BRIDGE (>$100M)
    - US50 Blue Mesa Bridges Emergency Repairs
11. National Scenic Byways Program
    - Mount Blue Sky Scenic Byway: Interpretation & Corridor Management Plan
    - Roadside Markers Improvements on Colorado Byways

IN PROGRESS
CDOT is actively pursuing the following discretionary grant program(s):

1. RAISE
    - CDOT is pursuing grants for 8 Mile in Region 2, an I-76 Paving Bundle in R4, Glenwood Canyon in Region 3, and a Mountain Rail Resilience and Safety Bundle in Region 3
2. PROTECT
    - CDOT is pursuing grants for State-Wide Avalanche Mitigation (SWAP) in Region 3 and 5 and a statewide Culvert package

CDOT DISCRETIONARY GRANT SUCCESS BY THE NUMBERS
Since the IIJA was signed into law in November 2021…

- CDOT has been awarded $540.64M, including both direct and indirect via local agency partnerships

- 18 priority projects featured in our 10 Year Plan have won a federal discretionary grant
- The Floyd Hill to Veterans Memorial Tunnels Improvements Project received CDOT's largest award to date at $100M

Next Steps

Grants team is meeting with the Executive Director on 12/12 to finalize its slate of RAISE and PROTECT grants.

COLORADO CTIO Transportation Investment Office

Colorado Transportation Investment Office Memorandum

To: The Transportation Commission and the CTIO Board of Directors
From: Simon Logan, Special Projects Lead and Policy Analyst
Date: January 15, 2025

Subject: Globeville and Elyria Swansea (GES) Tolling Equity Program Progress Report

Purpose:

To update the Transportation Commission and the Colorado Transportation Investment Office (CTIO)[1] Board of Directors on the progress of the GES Tolling Equity Program.

Requested Action:

The purpose of this memo is informational only, and no action is being requested.

Background

The 2017 Record of Decision (ROD) for the Central 70 project included a commitment for CTIO to explore ways to provide discounted access to the Express Lanes for low-income residents of the GES neighborhoods. As a result, CTIO embarked on a year-long process to comply with this commitment and identify a program to bring to the CTIO Board of Directors for approval. This effort included significant engagement with peer agencies nationwide, the GES community, and other local stakeholders. The CTIO Board of Directors (CTIO Board) approved the program in April 2022.

The approved GES Tolling Equity Program has three main components:

1. Benefits
    - Toll credit ($100) and a transponder for eligible residents to access the Express Lanes.
    - Free Transit passes. Available within the community at various distribution sites.
2. Eligibility:
    - Residents of GES with an annual household income below 200 percent of the federal poverty level (FPL) and households displaced from GES due to eminent domain for the I-70 Central Project with an annual household income below 200 percent of the FPL. CDOT holds a list of these displaced households.
    - Eligible residents don’t have to choose one or the other; they can receive both benefits.
2. Funding
    - Administrative and start-up costs, up to $1 million, provided by CDOT.

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[1] The High Performance Transportation Enterprise (HPTE) is now doing business as the Colorado Transportation Investment Office (CTIO). CTIO is how the enterprise refers to itself now and in the future. However, the HPTE name is retained for legislative and legal documents.

- CTIO covers the initial cost of the free transponder and promotional credit for all eligible residents.
- Each subsequent year, 15 percent of net toll revenue from the Central 70 Express Lanes is allocated for toll credit and transit passes, making this an ongoing benefit to the community.

In support of the program, the Transportation Commission (TC) approved an Intra Agency Agreement (IAA) between CDOT and CTIO, contributing one million dollars for start-up and administrative costs and activities. Per the IAA's terms, CTIO must provide an annual progress report by January.

Benefit distribution and partners

- **Transit Pass Distribution**
    - Seven sites within Globeville and Elyria-Swansea have been distributing the transit passes within the community. They include rec centers, libraries, and schools.
    - In the last year, the program has invested approximately $258,000 in 48,820 one way transit tickets (4,882 10 ride ticket books) an increase of 54% from the previous year.
- **Toll Credits and Transponder Distribution**
    - Almost 100 vehicles have been registered to date at a total cost of $14k.
    - NETC extended the enrollment window for in-person appointments and developed an online portal to receive enrollments throughout the year.
    - CTIO staff continues to conduct a review of outreach efforts to determine how to increase the number of enrolled participants in the toll credits element.
- **Partners**
    - **Community outreach and enrollment (NETC)**
        - CTIO continues to work with Northeast Transportation Connections (NETC) for community outreach, toll credit enrollment, and transit pass distribution.
        - NETC supports the development and distribution of promotional materials to increase program participation and educate the community on how to use Express Lanes.
    - **Toll credit account management (BancPass)**
        - CTIO has contracted with BancPass to manage the tolling element of the program. They offer more ways for participants to top up accounts using cash or cards, have more touch points to notify users when their balance is running low and provide customer services in English and Spanish.

Program reflections

- The GES Tolling Equity Program is going well overall and is really appreciated by program participants. The transit pass element continues to be popular, with an increasing number of residents receiving passes. The toll credits element has had a slower uptake than anticipated and requires more attention.
- CTIO staff use survey data and toll credit reports to gauge how the program could be improved to benefit the GES community. For example, door-to-door outreach was conducted within the community during the Summer of 2024 to seek to increase the number of vehicles registered on the toll credit element. Residents within GES were contracted to

conduct this outreach and gather information on people they spoke to about why they wouldn't or didn't sign up. A survey of the 245 responses received is included in Appendix A. High-level takeaways include:

- Around 40% of respondents either don't drive on the interstate, aren't comfortable sharing documentation, do not own a vehicle, or it is not registered in GES (around 10%). This population is highly unlikely to sign up for the tolling element of the program, further reducing the pool of potential vehicles to around 4250.
- This survey points to possible programmatic changes that could improve program participation, such as changes to income verification and vehicle registration.

Next Steps

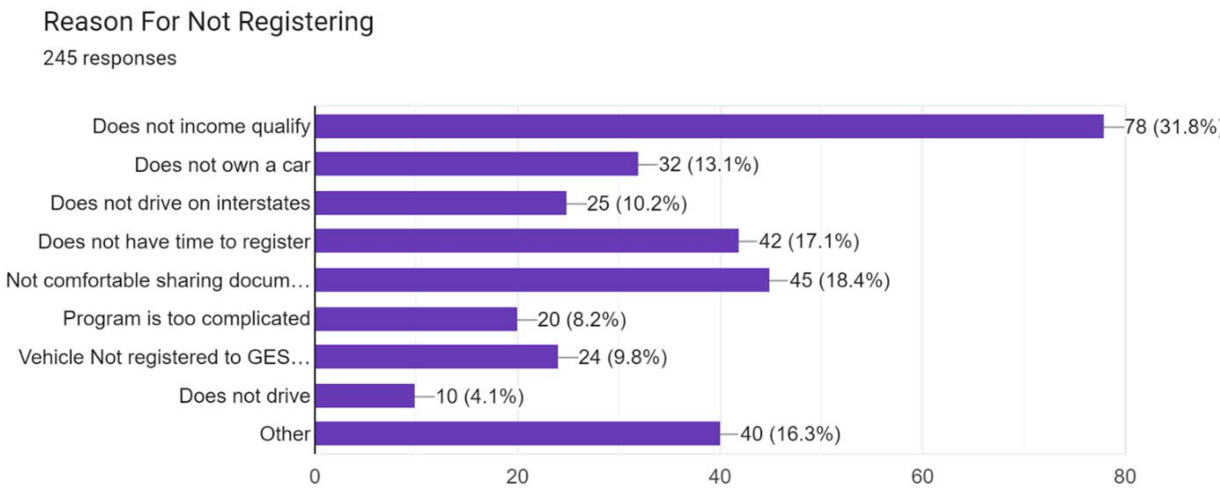
1) CTIO Staff will discuss proposed changes with the CTIO Board of Directors and bring any necessary documentation (if relevant) for approval in early 2025.
2) Another transit pass survey will be conducted (October 2023 was the last one) to continue gathering data on how the passes are used.
3) CTIO will provide another progress report on or before January, 2026.

Attachments:

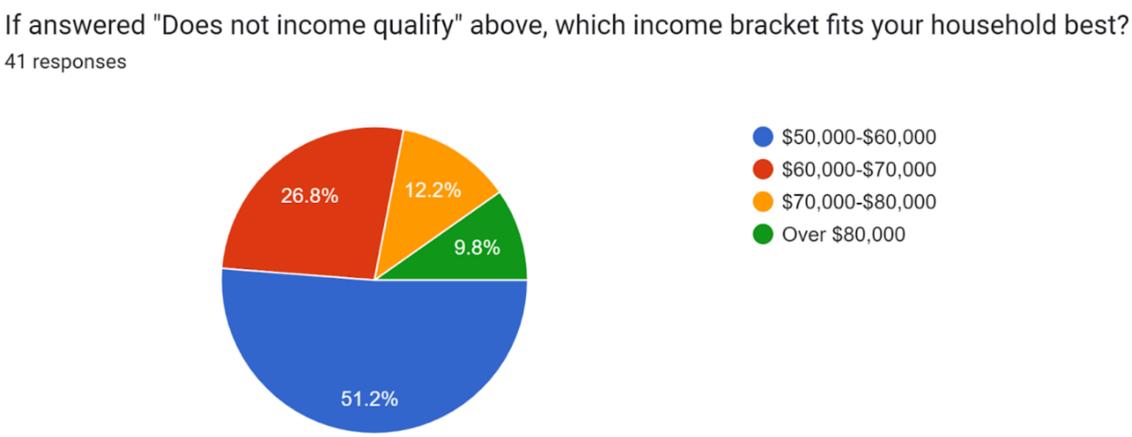
- Attachment A: Summary of Survey of GES Residents (door-to-door outreach re toll credits)
- Attachment B: Toll Credits Dashboard
- Attachment C: Toll Credit Users Survey

Appendix A: Summary of Survey of GES Residents (door-to-door outreach re toll credits)

B. Door-to-door survey (Summer 2024)
Door-to-door outreach was conducted by community members in the Summer of 2024 to increase the participation rate in the toll element of the program. If an individual decided not to discuss the program or not to sign up, they were asked for the reason. This survey captures the feedback received from 245 residents.



47 responses were collected for those that selected others. Their responses ranged from do not driving on the interstate, vehicle not registered to an address in GES (a requirement), too expensive to register the vehicle in GES (higher insurance premiums), and the car isn't functioning.

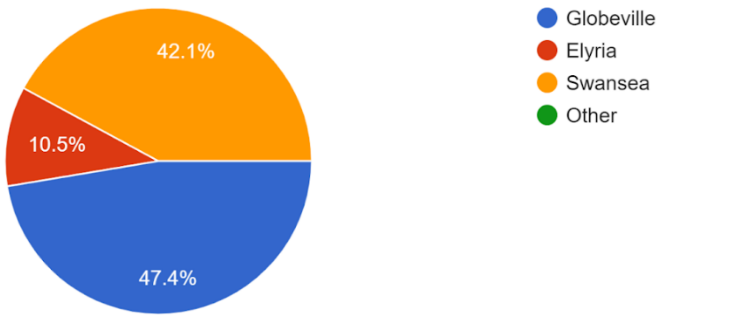


C. Toll credit element users survey (Summary 2024)

Toll credit users (approximately 60 users) were surveyed to gather more information on how they use their accounts, etc. The results below are from 19 individuals who shared their responses.

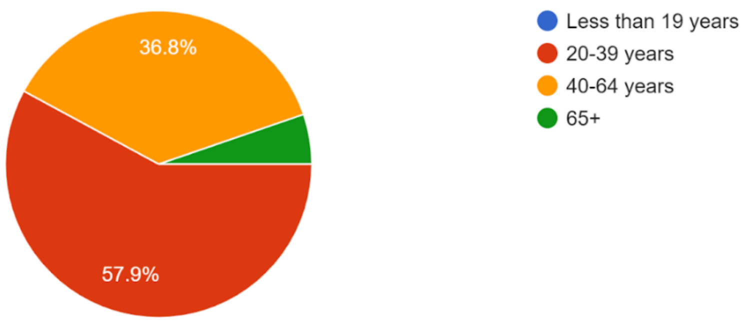
Which community do you live in? (Choose 1)

19 responses



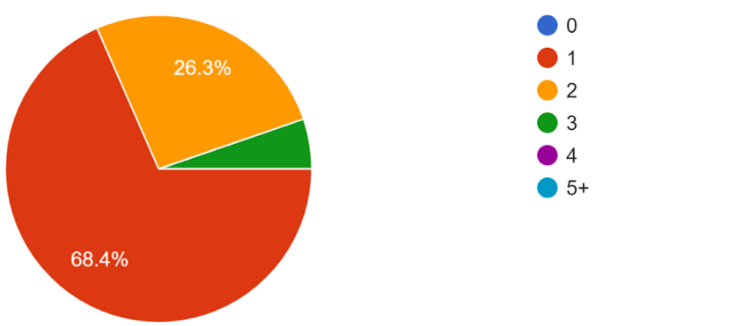
Which age group do you belong to? (Choose 1)

19 responses



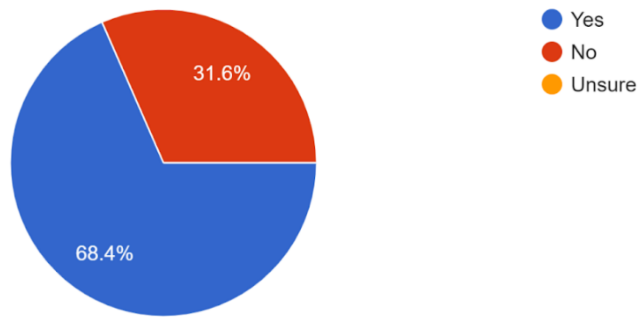
How many vehicles do you have on the program?

19 responses



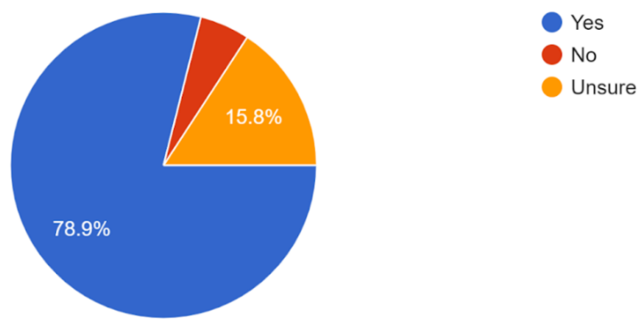
Have you been using the BancPass App to manage your account?

19 responses



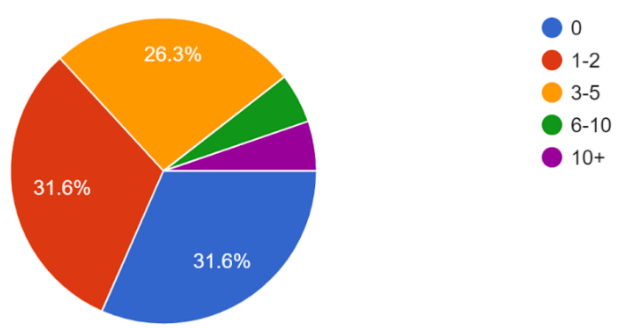
Has it been easy to manage your account through the BancPass App?

19 responses



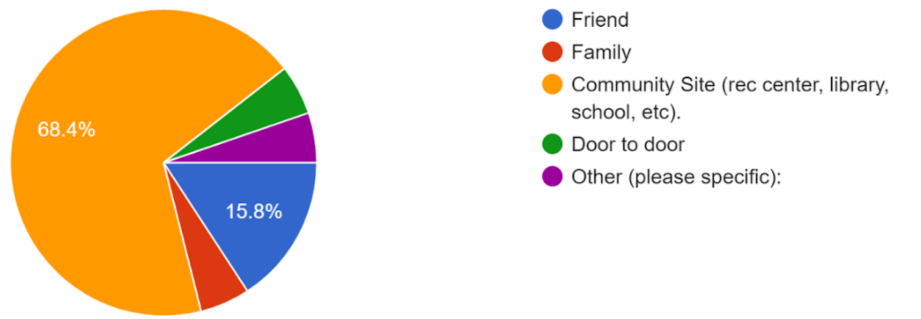
On average, how many trips in HOV3+ (traveling with three or more people with the transponders in “HOV” mode) did you make in the last month? (Choose 1)

19 responses



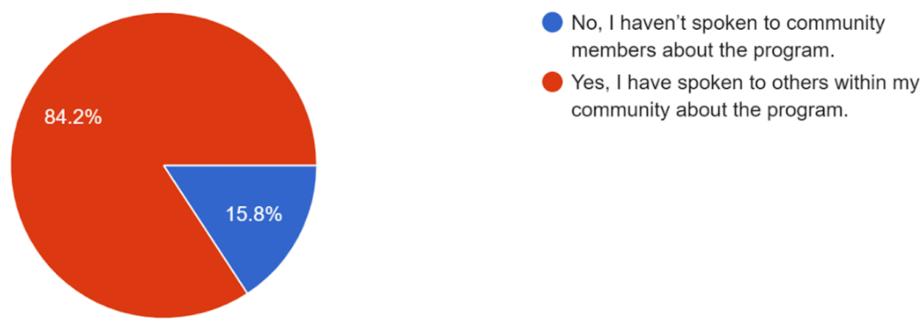
How did you hear about the program? (choose one)

19 responses



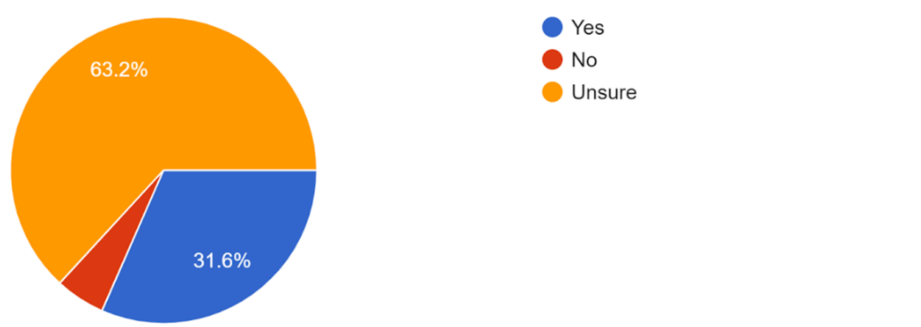
Have you spoken to others about the program? (choose one)

19 responses



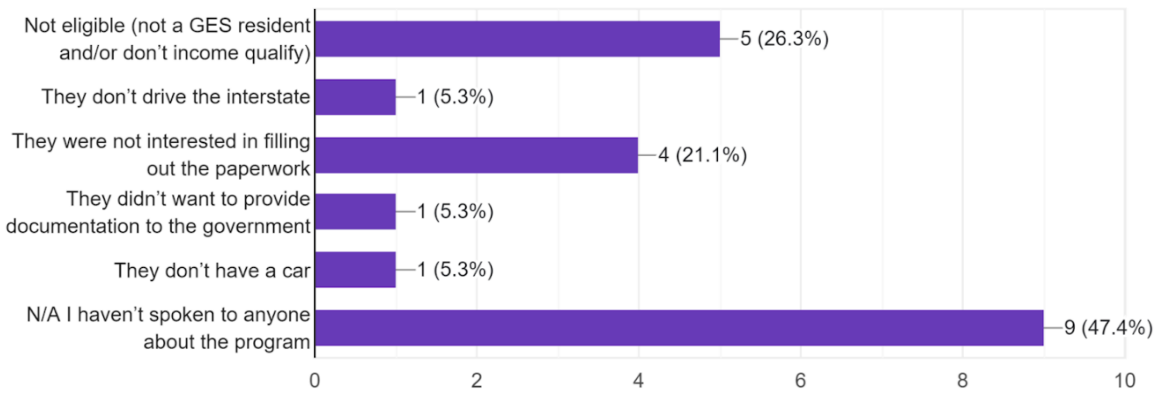
Did they also sign up for the program? (choose one)

19 responses



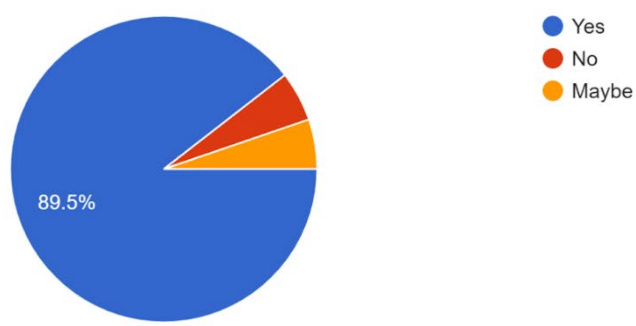
If they didn't sign up for the program, did they give a reason as to why they wouldn't? (Select all that apply)

19 responses



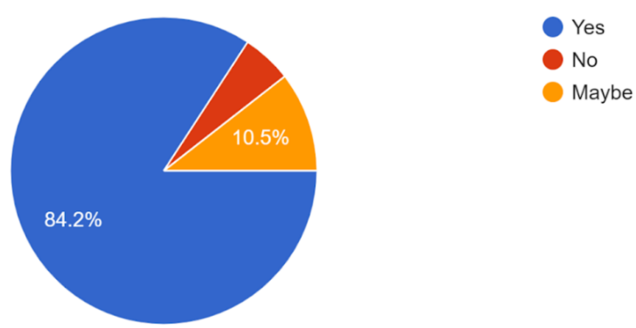
Would you recommend the program to your friends and family? (choose one)

19 responses



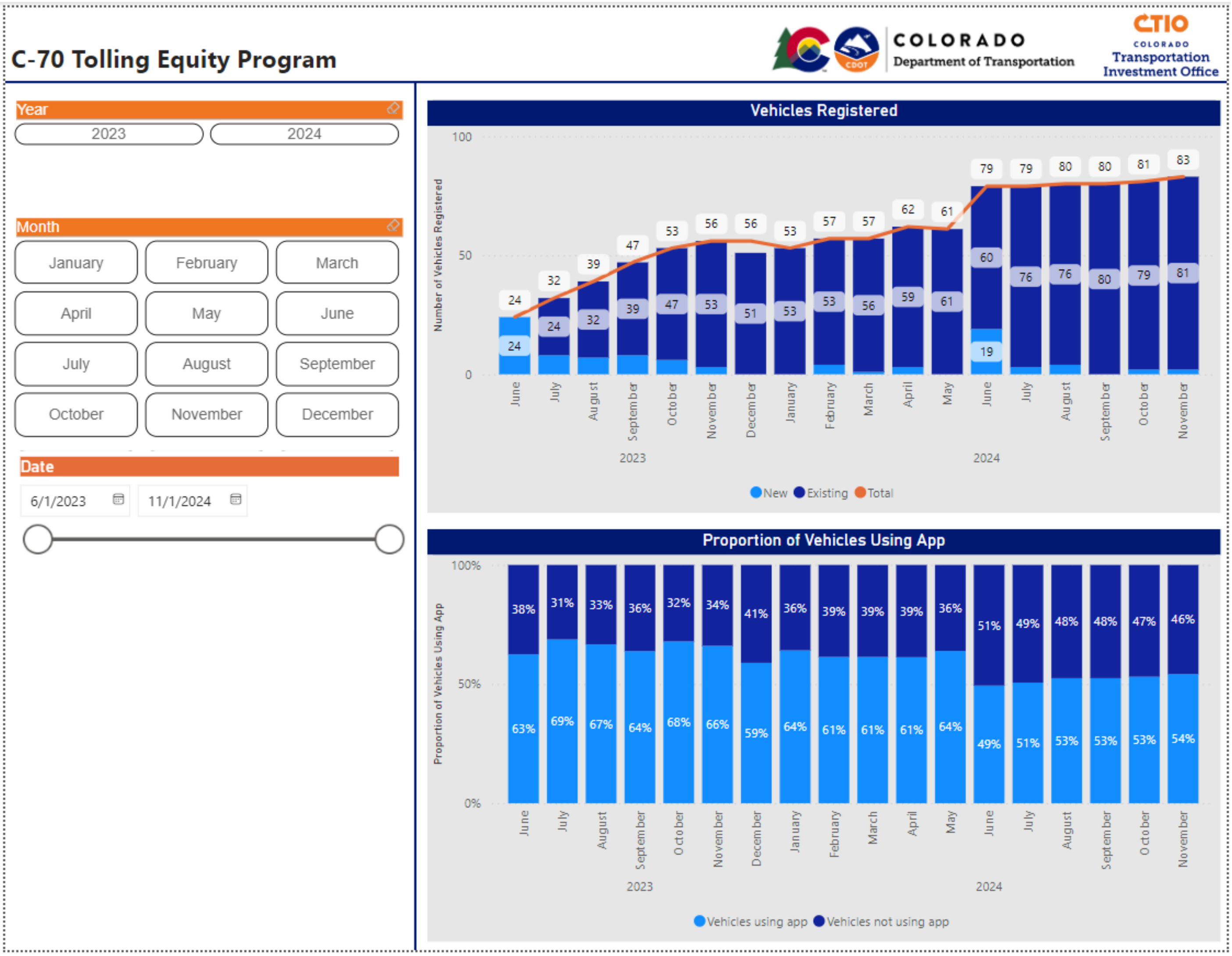
If CTIO offered additional toll credits for helping you sign up friends and family for the program, would that appeal to you? (choose one)

19 responses



Attachment B: Toll Credits Dashboard

PlusPass, the vendor used to manage the toll credits element, provides monthly reports to CTIO staff detailing the number of vehicles registered, the proportion of vehicles using the app, and spending data. The graphs below cover the period from June 2023 to November 2024.



C-70 Tolling Equity Program

COLORADO Department of Transportation

CTIO COLORADO Transportation Investment Office

Year

2023 | 2024

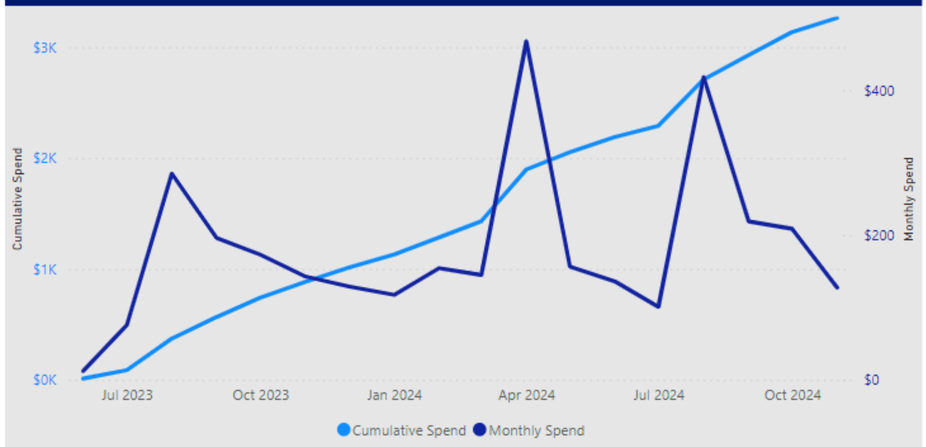
Month

January	February	March
April	May	June
July	August	September
October	November	December

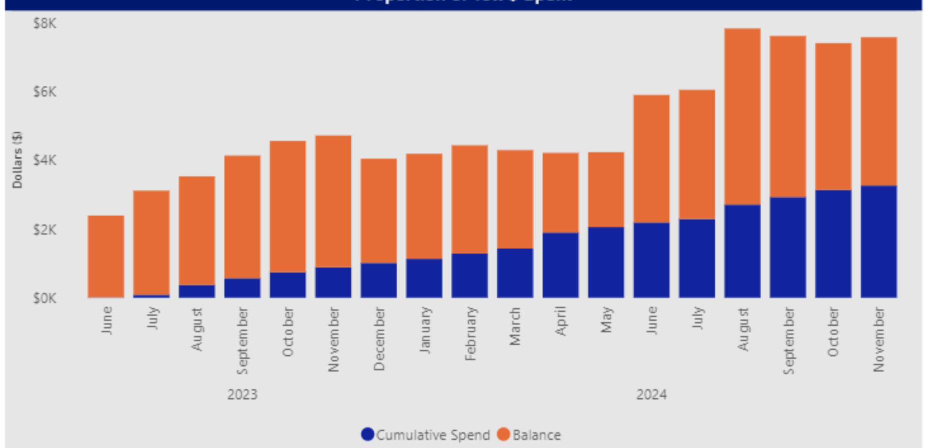
Date

6/1/2023 – 11/1/2024

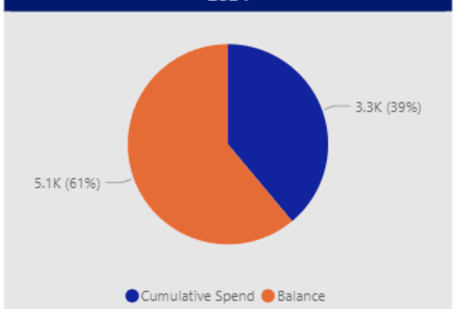
Cumulative & Monthly Toll $ Spent



Proportion of Toll $ Spent

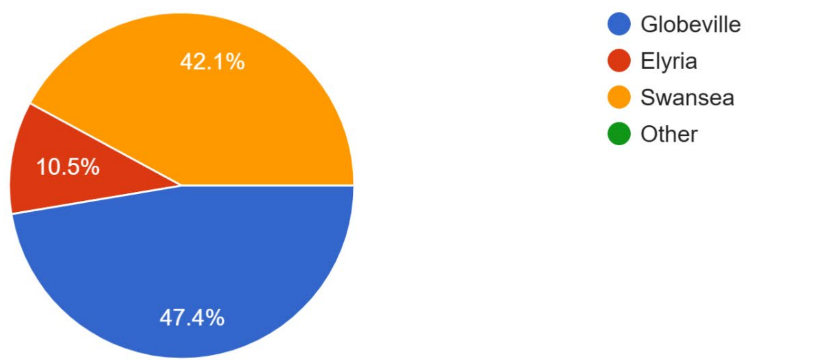


Proportion of Toll Dollars Spent as of November 2024

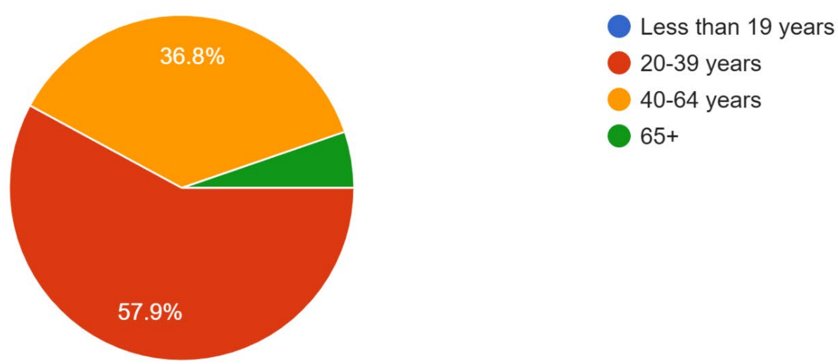


Attachment C: Toll Credit Users Survey
In the Fall of 2024, a survey was conducted of the participants in the toll element of the program. Around twenty individuals responded to the survey which sought to find out how people were using their credits and if they could be incentivized to encourage others to join the program. Nineteen people filled out the survey of the eighty six enrolled in the program (86 people with a total of 98 vehicles).

Which community do you live in? (Choose 1)
19 responses

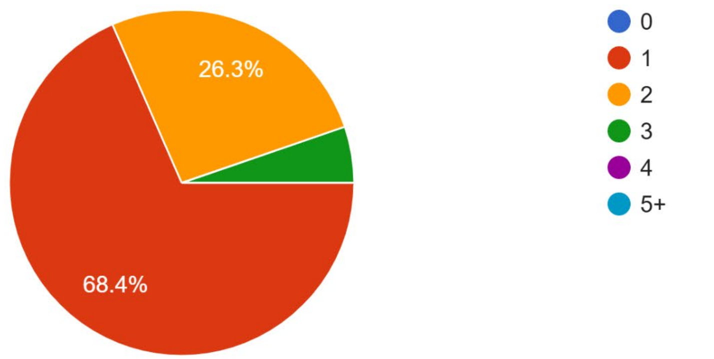


Which age group do you belong to? (Choose 1)
19 responses



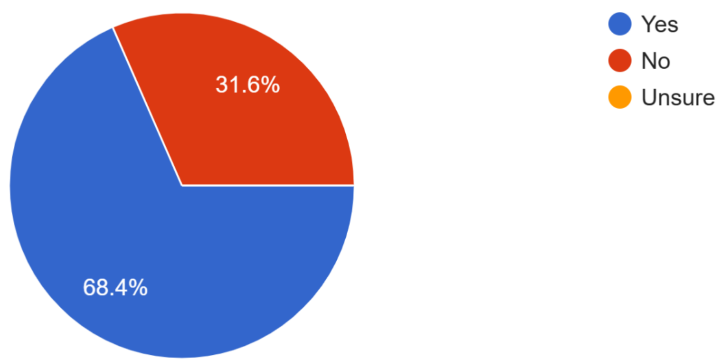
How many vehicles do you have on the program?

19 responses



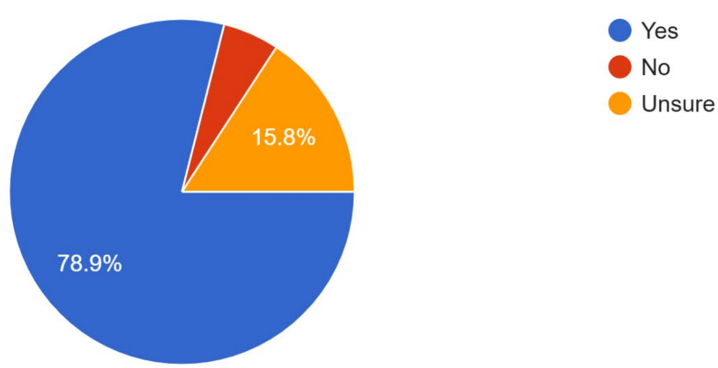
Have you been using the BancPass App to manage your account?

19 responses



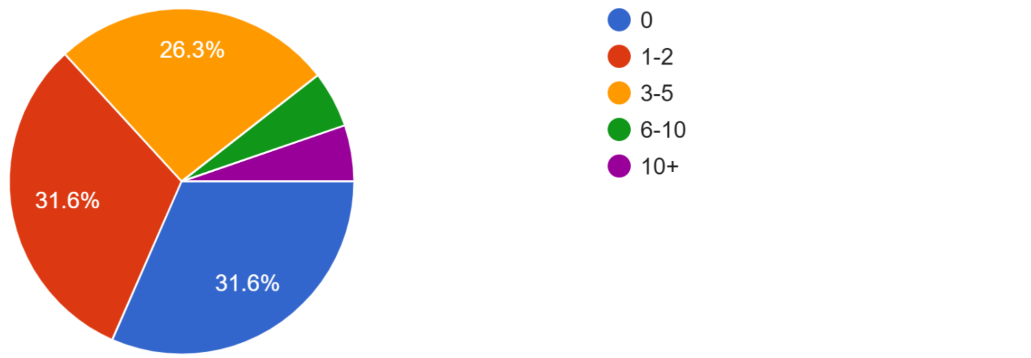
Has it been easy to manage your account through the BancPass App?

19 responses



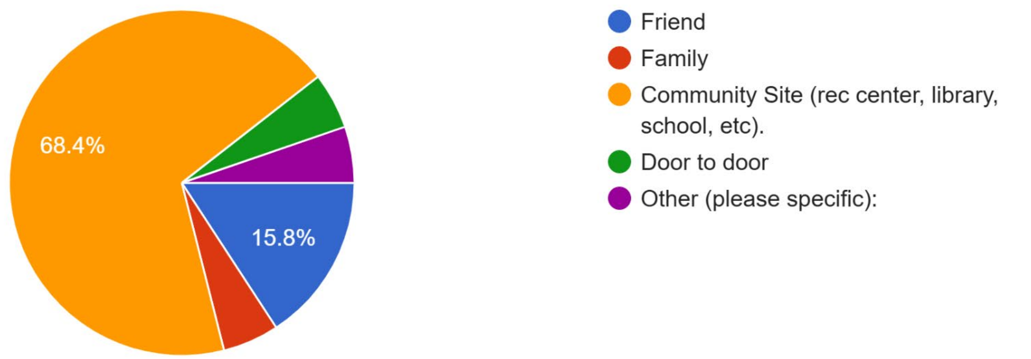
On average, how many trips in HOV3+ (traveling with three or more people with the transponders in "HOV" mode) did you make in the last month? (Choose 1)

19 responses



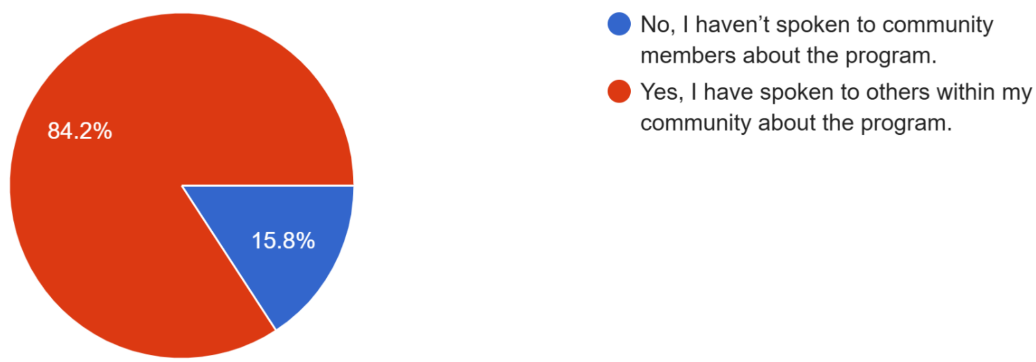
How did you hear about the program? (choose one)

19 responses



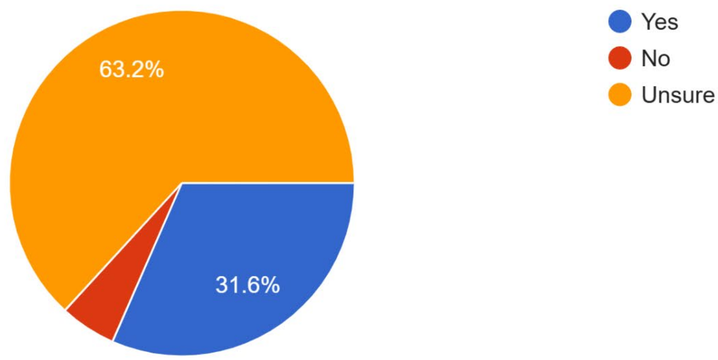
Have you spoken to others about the program? (choose one)

19 responses



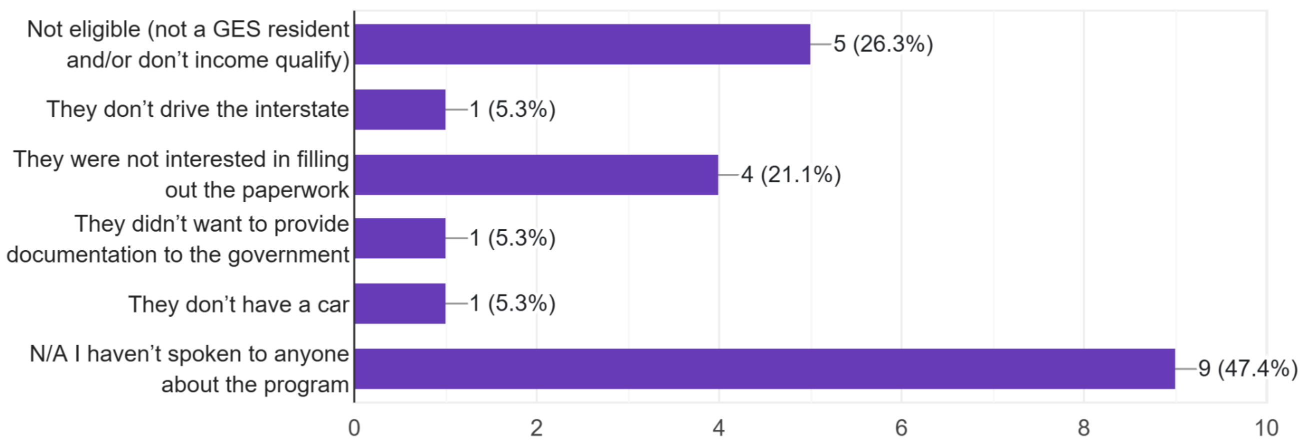
Did they also sign up for the program? (choose one)

19 responses



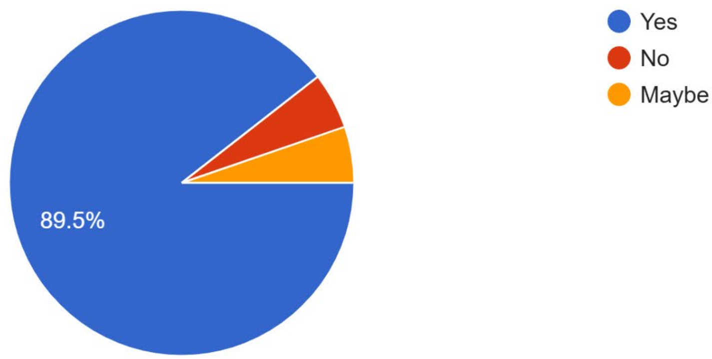
If they didn't sign up for the program, did they give a reason as to why they wouldn't? (Select all that apply)

19 responses



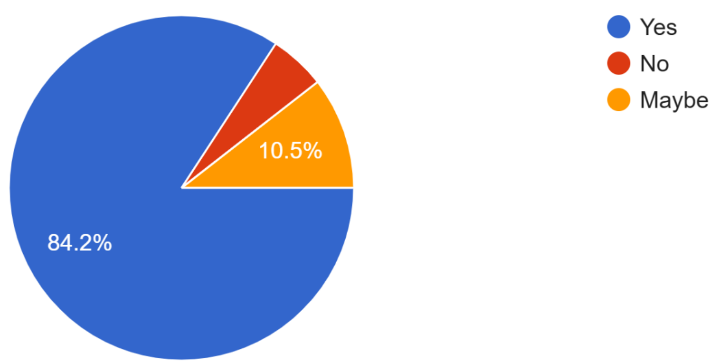
Would you recommend the program to your friends and family? (choose one)

19 responses



If CTIO offered additional toll credits for helping you sign up friends and family for the program, would that appeal to you? (choose one)

19 responses



COLORADO
Department of Local Affairs
Division of Local Government

2024 Regional Transportation Authorities Annual Report

Report to the State Auditor and Transportation Commission

December 11, 2024

Pursuant to C.R.S. 43-4-614 (3)(a), the following annual report is submitted for regional transportation authorities. In 2024, there were no new regional transportation authorities formed.

Existing authorities are summarily updated based on records of the Division of Local Government. The seven Regional Transportation Authorities for which the Division of Local Government has issued a Certificate of Organization are:

Roaring Fork Transportation Authority

The Roaring Fork Transportation Authority formed in 2000. The member local governments are Eagle County, Pitkin County, the City of Aspen, the Town of Carbondale, the City of Glenwood Springs, the Town of Basalt, the Town of Snow Mass Village, and the Town of New Castle. The Authority levies a property tax of 2.650 mills. The boundaries of the Authority have not changed since the Division's last annual report. A copy of the Authority's adopted 2024 budget is on file with the Division.

Gunnison Valley Transportation Authority

The Gunnison Valley Transportation Authority formed in 2002. The member local governments are Gunnison County, the City of Gunnison, the Town of Crested Butte, and the Town of Mt. Crested Butte. The boundaries of the Authority have not changed since the Division's last annual report. A copy of the Authority's adopted 2024 budget is included in the Gunnison County budget which is on file with the Division.

Pikes Peak Rural Transportation Authority

The Pikes Peak Rural Transportation Authority formed in 2004. The member local governments are El Paso County, the City of Colorado Springs, the City of Manitou Springs, the Town of Green Mountain Falls, the Town of Calhan, and the Town of Ramah. The boundaries of the Authority have not changed since the Division's last annual report. A copy of the Authority's adopted 2024 budget is on file with the Division.

South Platte Valley Regional Transportation Authority

The South Platte Valley Regional Authority formed in 2007. The member local governments are Logan County and the City of Sterling. The boundaries of the Authority have not changed since the Division's last annual report. A copy of the Authority's adopted 2024 budget is on file with the Division.

San Miguel Authority for Regional Transportation

The San Miguel Authority for Regional Transportation formed in 2016. The member local governments are San Miguel County, the Town of Telluride, the Town of Mountain Village, and the Town of Rico. The Authority levies a property tax of 0.750 mils. The boundaries of the Authority have not changed since the Division's last annual report. A copy of the Authority's adopted 2024 budget is on file with the Division.

Aerotropolis Regional Transportation Authority

The Aerotropolis Regional Transportation Authority formed in 2018. The member local governments are Adams County, the City of Aurora, and Aerotropolis Area Coordinating Metropolitan District. The Authority levies a property tax of 5.000 mills. The boundaries of the Authority have not changed since the Division's last annual report. A copy of the Authority's adopted 2024 budget is on file with the Division.

Eagle Valley Transportation Authority

The Eagle Valley Transportation Authority formed in 2022. The member local governments are Eagle County, the Town of Avon, the Town of Eagle, the Town of Gypsum, the Town of Minturn, the Town of Red Cliff, the Town of Vail, and Beaver Creek Metropolitan District. The boundaries of the Authority have not changed since the Division's last annual report. A copy of the Authority's adopted 2024 budget is on file with the Division. All referenced Authorities' budget information and formation documents are available on the Division's website at https://dola.colorado.gov/dlg_lgis_ui_pu/ by looking up each particular authority within the inventory of local governments.

Transportation Commission Memorandum

To: Transportation Commission
From: Darius Pakbaz - Director of Transportation Development, Nathan Lindquist, Senior Land Use Planner
Date: January 3, 2025

Subject: Annual Report on 1601 Interchange Application

Purpose
CDOT's 1601 Policy Directive sets the process by which CDOT may approve applications for new or modified interchanges on the state highway system. The 1601 Procedural Directive directs staff to provide the Transportation Commission with an annual report on 1601 applications that have been received in the previous year and that may come before the Transportation Commission.

Action
Informational only, no action required

Background
The following interchange projects have submitted application materials to the Division of Transportation Development (DTD) in 2024.

INTERCHANGE NAME	APPLICANT	LOCATION	INTERCHANGE TYPE
Monaghan Road	Arapahoe County	I-70 Exit 292 (three miles east of E-470 interchange)	Type 2 (significant modification to an existing interchange)
Lincoln Boulevard	Lone Tree	I-25 Exit 193	Type 2 (significant modification to an existing interchange
Happy Canyon Road	Castle Pines	I-25 Exit 187	TBD
Weld County Road 38	Mead	I-25 Mile Marker 247 (two miles north of main Mead interchange)	Type 1 (new interchange)

29 Road	Grand Junction	I-70 Mile Marker 29 (2 miles east of Horizon Drive interchange)	Type 1 (new interchange)

Next Steps

None at this time.

Attachments

None.

Transportation Commission Memorandum

To: The Transportation Commission

From: Jeff Sudmeier, Chief Financial Officer
Bethany Nicholas, Colorado Department of Transportation Budget Director

Date: January 16, 2025

Subject: January Budget Supplement

No Items for Approval. Balances of TC Funds are as follows:

Transportation Commission Contingency Reserve Fund Reconciliation

Date	Transaction Description	Amount	Balance
June-24	Balance 12S24		$3,677,851
July-24	Balance 1S25		$19,972,392
August-24	Balance 2S25		$19,972,392
September-24	Balance 3S25		$20,017,044
October-24	Balance 42S25		$20,102,544
November-24	Balance 52S25		$20,102,544
December-24	Balance 62S25		$20,102,544
January-25	Pending Balance 62S25		$20,102,544

Cost Escalation Fund Reconciliation

Date	Transaction Description	Amount	Balance
June-24	Balance 12S24		$9,608,937
July-24	Balance 1S25		$9,698,442
August-24	Balance 2S25		$9,879,960
September-24	Balance 3S25		$7,597,670
October-24	Balance 4S25		$6,136,803
November-24	Balance 5S25		$2,709,912
December-24	Balance 6S25		$2,564,645
January-25	Pending Balance 7S25		$2,564,645

Transportation Commission Program Reserve Fund Reconciliation

Date	Transaction Description	Amount	Balance
June-24	Balance 1S24		$6,870,207
July-24	Balance 1S25		$5,015,869
August-24	Balance 2S25		$4,415,869
September-24	Balance 3S25		$55,339,033
October-24	Balance 4S25		$50,439,033
November-24	Balance 5S25		$50,056,233
December-24	Balance 6S25		$50,043,478
January-25	Pending Balance 7S25		$50,043,478

Transportation Commission Maintenance Reserve Fund Reconciliation

Date	Transaction Description	Amount	Balance
June-24	Balance 12S24		$0
July-24	Balance 1S25		$12,000,000
August-24	Pending Balance 2S25		$12,000,000
September-24	Balance 3S25		$12,000,000
October-24	Balance 4S25		$12,000,000
November-24	Balance 5S25		$20,000,000
December-25	Balance 6S25		$20,000,000
January-25	Balance 7S25		$20,000,000